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APPENDICES
TO THE
TWENTY-SECOND VOLUME
OF THE
JOURNALS OF THE SENATE
OF
CANADA.

Session, 1888.

PRINTED BY ORDER OF PARLIAMENT.



OTTAWA:
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1888.

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APPENDIX.

LIST OF APPENDICES.

No. 1.—Report and evidence *in re* Resources of the Mackenzie Basin.

No. 2.—Report and evidence *in re* Depositing Sawdust in the River Ottawa.

REPORT

OF THE

SELECT COMMITTEE OF THE SENATE

APPOINTED TO ENQUIRE INTO THE RESOURCES OF THE

GREAT MACKENZIE BASIN.

SESSION 1888.

PRINTED BY ORDER OF PARLIAMENT.



OTTAWA:
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QUEEN'S PRINTER AND CONTROLLER OF STATIONERY.
1888.

THIRD REPORT
OF THE
SELECT COMMITTEE OF THE SENATE

CONSISTING OF HONORABLE MESSIEURS:

ALMON,	GOWAN,	MACDONALD, (B.C.)	POWER,
BOLDUC,	HOWLAN,	MACDONALD, (Midland)	REESOR,
BOTSFORD,	HARDISTY,	MACPHERSON, (Sir D. L.)	ROBITAILLE,
CARVELL,	KAULBACH,	MERNER,	SANFORD,
CHAFFERS,	LEONARD,	MILLER,	SCHULTZ,
FERRIER,	McCALLUM,	O'DONOHUE,	SUTHERLAND,
DICKEY,	McCLELAN,	OGILVIE,	THIBAudeau,
GIRARD,	McINNES, (B.C.)	PELLETIER,	TURNER.

APPOINTED TO INQUIRE INTO

The resources of that part of the Dominion lying north of the Saskatchewan watershed, east of the Rocky Mountains and west of Hudson's Bay, and comprising the Great Mackenzie Basin—its extent of navigable rivers, lakes and sea coast, of arable and pastoral land, its fisheries, forests and mines, and to report upon its possible commercial and agricultural value.

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REPORT.

The Select Committee appointed by your Honorable House to enquire into the resources of the Great Mackenzie Basin and the country eastward to Hudson's Bay, have the honor to make their Third Report as follows:—

Your Committee desire that this report be considered an interim one and the estimates given to be approximate, inasmuch as they are based upon evidence received up to this date, and a final report can only be made when answers shall have been received to questions sent to officers of the Hudson's Bay Company, Missionaries, Arctic explorers, and others, now resident in, or who have visited parts of the country within the scope of your Committee's enquiry. A list of these names and of the enquiries made is herewith submitted.

Your Committee desire to acknowledge the courtesy of the Departments of Marine and Fisheries, Agriculture, Customs, Railways and Canals, and of the Interior, with its Geological Survey, and Indian Branch; also the value of information received from Professors Selwyn, Bell, Dawson, Macoun and Saunders, as well as from gentlemen a list of whose names is submitted herewith, from whom evidence was received of very great value.

Your Committee also desire to state that they have incurred no expense, other than that authorized by your Honorable House, except the sum of \$41.25 for outside printing necessitated by the desire of the Committee to immediately forward their list of questions to far distant posts. The lithographing of the maps which accompany this report being paid for by members of the Committee themselves.

The evidence your Committee have been able to obtain up to this date has been of an unusually valuable character, being principally oral, and from those who had exceptional opportunities of acquiring information, and after carefully comparing this evidence your Committee have arrived at the following conclusions, in which they have endeavored, where estimates are given, to be within the limit authorized by the information in question.

REGARDING NAVIGATION.

1st. The extent of the scope of the enquiry covers one million two hundred and sixty thousand square statutory miles, which area includes none of the islands of the Arctic Archipelago.

2nd. Its coast line on the Arctic Ocean and Hudson's Bay measures about 5,000 miles, which estimate does not include the coast lines of inlets or deeply indented bays.

3rd. That over one-half of this coast line is easily accessible to whaling and sealing crafts.

4th. The navigable coast lines of the larger lakes of the region in question amount to about 4,000 miles, while its total lacustrine area probably exceeds that of the eastern Canadian American chain of great lakes.

5th. That there is a river navigation of about 2,750 miles, of which 1,390 miles is suitable for stern-wheel steamers, which with their barges may carry three hundred tons; the remaining 1,360 miles being deep enough for light draught sea-going steamers.

6th. That there is a total of about 6,500 miles, of continuous lake coast and river navigation, broken only in two places.

7th. That the two breaks in question are upon the Great Slave and Athabasca Rivers, the first being now overcome by a 20-mile waggon road from Fort Smith southwards on the Great Slave River, and the latter being a stretch of 70

miles on the Athabasca, of questionable navigation above Fort McMurray, down which flat boats or scows descend, but cannot ascend, and which about 50 miles of waggon road would overcome, while some improvement of the rapids might render the whole river navigable.

8th. That with suitable steam crafts this river and lake navigation may be connected with Victoria and Vancouver by way of the mouth of the Mackenzie, the Arctic Ocean and Behring Straits and Sea, and it is now connected on the south by 90 miles of waggon road, between Athabasca Landing and Edmonton, with navigable water in the Saskatchewan River.

ARABLE AND PASTORAL LANDS:

9th. That within the scope of the Committee's enquiry there is a possible area of 656,000 square miles fitted for the growth of potatoes, 407,000 square miles suitable for barley, and 316,000 square miles suitable for wheat.

10th. That there is a pastoral area of 860,000 square miles, 26,000 miles of which is open prairie with occasional groves, the remainder being more or less wooded; 274,000 square miles, including the prairie, may be considered as arable land.

11th. That about 400,000 square miles of the total area is useless for the pasturage of domestic animals or for cultivation. This area comprising the Barren Grounds and a portion of the lightly wooded region to their south and west.

12th. That throughout this arable and pastoral area latitude bears no direct relation to summer isotherms, the spring flowers and the buds of deciduous trees appearing as early north of Great Slave Lake as at Winnipeg, St. Paul and Minneapolis, Kingston, or Ottawa, and earlier along the Peace, Liard and some minor western affluents of the Great Mackenzie River, where the climate resembles that of western Ontario.

13th. That the native grasses and vetches are equal and in some districts superior to those of eastern Canada.

14th. That the prevailing south-west summer winds of the country in question bring the warmth and moisture which render possible the far northern cereal growth, and sensibly affect the climate of the region under consideration as far north as the Arctic circle and as far east as the eastern rim of the Mackenzie Basin.

FISHERIES, FORESTS AND MINES.

15th. The immense lacustrine area of the eastern and northern portions of the area under consideration implies, from the evidence given regarding the quantity and quality of fresh water food fishes, the future supply of a great portion of the North American continent; while, though there has been obtained less evidence regarding sea fish, yet the following have been found on the northern and eastern coast within the scope of the present enquiry, viz.: salmon, on four of the rivers emptying into Hudson's Bay on its western shore, and in all the rivers flowing into the Arctic Ocean, except the Mackenzie, where an entirely different but also valuable species, the *Salmo Mackenziei*, having the local name of the *Inconnu*, exists in great numbers. The capelin is found on the coast of the Arctic Ocean and Hudson's Bay, thus implying the presence of cod upon banks near by, and the rock cod has been frequently taken. The Greenland, or harp seal, and the grey square flipper seal are common to the eastern coasts, while the present favorite whaling grounds of the New England whalers are Hudson's Bay, Fox Channel, and Boothia Bay. These animals are all found with the walrus and porpoise off the mouths and in the estuary of the Mackenzie, as well.

16th. The forest area has upon it a growth of trees well suited for all purposes of house and ship building, for mining, railway and bridging purposes, far in excess of its own needs, and of great prospective value to the treeless regions of Canada and the United States to the south, the growth on the Laurentian formation being scant, but the alluvial portion has upon it (on the river of its name and elsewhere) the "Liard," a balsam poplar, sometimes called Balm of Gilead or rough bark poplar,

120 feet high, with a stump diameter of 5 to 6 feet. The *white spruce*, 150 feet high, with a stump diameter of 4 to 5 feet; the *larch*, of about the same size, and the *banksian pine*, whose straight stem is often 100 feet long, with only two feet of diameter at the stump.

17th. Of the mines of this vast region little is known of that part east of the Mackenzie River and north of Great Slave Lake. Of the western affluents of the Mackenzie enough is known to show that on the headwaters of the Peace, Liard and Peel Rivers there are from 150,000 to 200,000 square miles which may be considered auriferous, while Canada possesses west of the Rocky Mountains a metalliferous area, principally of gold-yielding rocks, thirteen hundred miles in length, with an average breadth of four to five hundred miles, giving an area far greater than that of the similar mining districts of the neighboring Republics.

18th. In addition to these auriferous deposits, gold has been found on the west shore of Hudson's Bay, and has been said to exist in certain portions of the Barren Grounds. Silver on the Upper Liard and Peace Rivers, copper upon the Coppermine River, which may be connected with an eastern arm of Great Bear Lake by a tramway of 40 miles, iron, graphite, ochre, brick and pottery clay, mica, gypsum, lime and sandstone, sand for glass and moulding, and asphaltum, are all known to exist, while the petroleum area is so extensive as to justify the belief that eventually it will supply the larger part of this continent and be shipped from Churchill or some more northern Hudson's Bay port to England.

19th. Salt and sulphur deposits are less extensive, but the former is found in crystals equal in purity to the best rock salt and in highly saline springs, while the latter is found in the form of pyrites, and the fact that these petroleum and salt deposits occur mainly near the line of division between deep water navigation and that fitted for lighter craft, give them a possible great commercial value. The extensive coal and lignite deposits of the lower Mackenzie and elsewhere will be found to be of great value when the question of reducing its iron ores and the transportation of the products of this vast region have to be solved by steam sea-going or lighter river craft.

20th. The chief present commercial product of the country is its furs, which, as the region in question is the last great fur preserve of the world, are of very great present and prospective value, all the finer furs of commerce being there found, and the sales in London yearly amounting to several millions of dollars.

21st. The Indian population is sparse, and the Indians, never having lived in large communities, are peaceable, and their general character and habits as given by witnesses justify a hope that the development of the country, as in the case of the Indians of British Columbia, may be aided by them without great danger of their demoralization and with a reasonable hope that, as in the case of the Indians mentioned, their condition may be improved.

Your Committee desiring to refer briefly to the evidence upon which they have based these conclusions, may explain that very early in their investigations they became convinced that very little more was known of the northern and eastern portion of the area committed to them for investigation than was known of the interior of Africa or Australia. Arctic explorers had indeed traversed its coast line and descended two of the rivers which, east of the Mackenzie, flow into the Arctic Sea, but the object sought by them was one which had no relation to that of the present enquiry and it is only incidentally that their records are now valuable. The knowledge of missionaries and officers of the Hudson's Bay Company is chiefly confined to the watercourses and the great lakes, while scientific exploration has not as yet extended north of Great Slave Lake.

In referring again to the navigation of this region all the evidence has agreed as to the great extent of unbroken navigation, and this fact has been of great use to the Hudson's Bay Company, who have always used the waterways, even when circuitous and difficult, rather than resort to land carriage, and their inland posts to as far north as the Arctic circle are now supplied from their central depot at Fort Garry with only 114 miles of land carriage, four of this being by tramway at the Grand Rapids

of the Saskatchewan, ninety miles of waggon transport from Edmonton to Athabasca Landing, thence by steamer and flatboat to Fort Smith on the Great Slave River, where twenty miles of waggon road connects the shallow with deep water navigation, and the steamer "Wrigley" distributes them to the various posts down to the mouth of the Mackenzie just above its estuary, where the river is said to be six miles wide, and up Peel River which joins the Mackenzie near that point to Fort Macpherson on that gold-bearing stream. The great lakes which receive the drainage of this vast region and give an equal flow to the Mackenzie, all have deep water navigation, and like most lakes of the Laurentian formation are studded with islands.

The most southern source of the Great Mackenzie River is a stream fed by the glaciers of Mounts Hooker and Brown, two of the highest of the Rocky Mountain chain, in latitude $52^{\circ} 30'$, and this soon becomes a navigable stream, preserving that character except at the breaks mentioned, during the nearly 2,500 miles of its course to the Polar Sea. As already mentioned these western affluents will form valuable links as a means of taking in machinery and mining supplies to the upper waters of the Peace and Liard Rivers which are now inaccessible for heavy machinery from the west coast, and the cost of taking in provisions, makes in mining and prospecting efforts a serious desideratum. The navigation upon the Liard River also will be an important factor in the future food supply to the great mining region of the upper Yukon and Peel Rivers.

A reference to the valuable evidence obtained by your Committee will show that navigation from Behring Straits to the mouth of the Mackenzie, and probably as far east as Wollaston Land, may be had for three months in each year, the soundings given on the Admiralty Chart of that portion of the Arctic Sea revealing an average depth of about 20 fathoms, which is a considerable depth in what is known to be generally a shallow sea. The western branch of the estuary of the Mackenzie is said to be the outlet which has the deepest waters and it is respectfully submitted that much good might accrue were the Dominion Government party now working its way from the Yukon towards Peel River and the Mackenzie, to descend either of these streams and examine the western and other branches of the estuary of the Mackenzie.

To convey to your Honorable House the distances which separates the navigable waters of the Mackenzie Basin from the eastern and western sea coasts and from navigable rivers and railways to the south and south-east the following table of distances has been taken from the evidence. The lengths are in straight lines as follows:—

From the head of Great Slave Lake to head of Chesterfield Inlet, 320 miles; from the head of Athabasca Lake to the harbor of Churchill, 440 miles; from Fort McMurray at the junction of the Clearwater with the Athabasca below the 70 miles of questionable navigation to the following places on the Saskatchewan: Prince Albert, 300 miles; Fort Pitt, 220 miles; Victoria, 179 miles; Edmonton, 225 miles; from Calgary, on the Canadian Pacific Railway, to Athabasca Landing, on the Athabasca River, 250 miles; from head of Little Slave Lake to Peace River Landing in the Peace River, 65 miles; from Hazelton, on the Skeena River, to Peace River in the Pass, 150 miles; from Fort Mumford on the Stikine River to Fort Liard on the Liard River, 370 miles.

A good deal of difficulty has been experienced by the Committee in endeavoring to obtain the exact catch of furs in the region under consideration, and no definite or direct information has been obtained; they have, however, obtained lists of furs offered for sale in 1887, in London, by the Hudson's Bay Company and C. M. Lampeon & Co., the consignee of many of the furs of British North America, and from these lists they find the following to be a summary of one year's catch:—

Otter.....	14,439
Fisher.....	7,192
Fox (silver).....	1,967
Fox (cross).....	6,785
Fox (red).....	85,022

Fox (white)	10,257
Fox (blue).....	1,440
Fox (kitt)	290
Lynx	14,520
Skunk	682,794
Marten	98,342
Mink	376,223
Beaver	104,279
Musquash	2,485,368
Extra black Musquash.....	13,944
Wolf	7,156
Wolverine	1,581
Bear (all kinds).....	15,942
Musk ox.....	198
Badger.....	3,739
Ermine	4,116
Swan.....	57
Rabbit.....	114,824
Hair seal (dry).....	13,478
Sable.....	3,517
Fox (grey).....	31,597

It will be seen by those who have a knowledge of the great value of these rich northern furs, a large proportion of which may be presumed to have come from the Mackenzie Basin, how large and important that trade has been, and it is expedient, that, without unduly interfering with the rights of settlers or the usual privileges of Indians, this great fur trade should be fostered and even made a source of direct revenue to the Dominion.

The Right Reverend Bishop Clut, in his evidence called attention to the damage to this interest caused by the use of "poison" which is strychnia of the most powerful kind, in the capture of such animals as the fox or wolf. He deprecates its use, first on account of the danger to those using it and from the fact that it caused useless destruction, inasmuch as the foxes and wolves that swallow the frozen bait have time to run and die far beyond where they may be found and in the case of other animals for which it is not intended, it destroys directly by eating the bait, and indirectly by the eating of the animals which have been poisoned by it.

Again there is great danger of some species of fur-bearing animals becoming extinct by the greater ease in their capture, such as the beaver, which many years ago became almost extinct in the United States when fashion necessitated the exclusive use of its fur in felt and other hats, and more recently the same prospect of extirpation threatened the mink which now threatens the south sea or fur seal; these considerations pointing to the expediency of the Government making a measure of protection a source of revenue by the leasing of certain fur districts with a limitation as to the catch of certain kinds of its furs.

Of the fresh water food fishes of the region, Back's "Grayling," an excellent species not prevalent elsewhere, seems to be found everywhere in its rivers, and even west of the Rocky Mountains, but the staple product of its lakes and large rivers, seems to be whitefish of great weight and excellent flavor, and trout often reaching forty pounds in weight, and evidence goes to show that the farther north the greater the yield of fish till the quantity becomes enormous. As an illustration the following is given from the evidence of Prof. Macoun, who quotes Sir John Richardson to the effect that one of the early overland Franklin expeditions took fifty thousand white fish on a north-eastern arm of Great Bear Lake, and Sir John Richardson also states that the great lake trout swarm in all the northern great lakes.

In regard to the salmon fisheries, it would appear from the evidence that salmon are abundant in the rivers and along the coast of the north-west side of Hudson's Bay as well as in the rivers of the northern shores of the continent. Your Committee consider it advisable that means should be adopted to ascertain more accurately

the extent and value of the salmon fisheries of these regions, with a view to utilizing them for the purposes of commerce and for the revenue which they may afford.

The seas adjoining the great territory which your Committee has had under investigation, are frequented by whales of different species, walruses, narwhals and a variety of seals. All these animals are valuable for their oil, but the large species of whales have heretofore been most sought for. Only a few years ago these animals had a much more extensive range than at the present time. Owing to improvements in navigation and methods of capture they have, of late years, fallen an easier prey to their pursuers and have taken shelter in the less frequented seas of the northern coasts of Canada. Now they are being pursued to their last retreat by foreign whalers, and some species are threatened with complete extinction in a few years if this condition continues. It is to be borne in mind that whales are long lived and slow breeding animals. The American whalers attack them with harpoons, explosive bombs and lances, fired from large swivel-guns carried on steam launches, instead of the old-fashioned weapons thrown by hand from rowboats. These methods not only destroy the whales with greater facility, but inspire the survivors with such terror that they seek the most distant and inaccessible parts of the northern seas and have entirely disappeared from the waters in which they lived only a few years ago.

Your Committee are informed that the Russian Government claim jurisdiction over the whale fisheries of the White Sea, and exact a heavy license from each vessel engaged in the fishing, and that the Alaska Fur Company asserts a similar authority over the seal fisheries of Behring Sea, both of which are open to the ocean, while Hudson Bay, Boothia Bay and other bays and channels in the northern part of the Dominion, which are resorted to by foreign whalers, may be considered as closed seas being almost completely surrounded by our own territory. Your Committee would, therefore, recommend that some measures may be adopted with a view to protecting the whale fisheries of our northern waters and at the same time of deriving a revenue therefrom. Should this not be done then as soon as the larger whales shall have become extinct, the slaughter of our smaller oil-producing mammals will commence and as these creatures live in shallow water or nearer shore, further encroachments on our rights will probably result.

The evidence submitted to your Committee points to the existence in the Athabasca and Mackenzie Valleys of the most extensive petroleum field in America, if not in the world. The uses of petroleum and consequently the demand for it by all nations are increasing at such a rapid ratio, that it is probable this great petroleum field will assume an enormous value in the near future and will rank among the chief assets comprised in the Crown domain of the Dominion. For this reason your Committee would suggest that a tract of about 40,000 square miles be, for the present, reserved from sale and that as soon as possible its value may be more accurately ascertained by exploration and practical tests; the said reserve to be bounded as follows: Easterly by a line drawn due north from the foot of the Cascade Rapids on Clearwater River to the south shore of Athabasca Lake; northerly by the said lake shore and the Quatre Fourche and Peace Rivers; westerly by Peace River and a straight line from Peace River Landing to the western extremity of Lesser Slave Lake, and southerly by said lake and the river discharging it to Athabasca River and Clearwater River as far up as the place of beginning.

Your Committee regret that they have made so long a report, but trust that an excuse will be found in the fact that upon a map of similar projection and scale the region in question occupies an area greater than the Australian continent or two-thirds of Europe, covering part of the British Islands, Norway, Sweden, Denmark, Germany, Austria and a part of France and Russia.

Your committee have reason to believe that a comparison of the capabilities of this extent of country in our own continent, exceeds in extent of navigation, area of arable and pastoral lands, valuable fresh water fisheries, forests and mines and in capacity to support population, the continental part of Europe to which we have referred.

Many important points have therefore been omitted from this report, for information upon which your Committee beg to refer your Honorable House to the evidence itself; they have, however, accompanied this report, as being a necessary adjunct, with four maps of a size suitable to form two pages of this report, carefully prepared by Robert Bell, Esq., M.D., LL.D., Assistant Director of the Geological Survey; the first showing upon it in colors, the northern and eastern extent of possible potato, barley and wheat growth, the pastoral, prairie, and wood region, and the barren grounds, the second showing in colors the mineral deposits in the Mackenzie Basin; the third shows the southern limit of the feeding grounds of the musk ox and of the reindeer; the northern range of the wolverine, otter, beaver, black bear, and Virginia deer, the former range of bison and wood buffalo, and the present range of the moose, the Greenland seal, and of the larger whales, and the fourth shows in colors the extent of the river, lake, and sea coast navigation and the coal and lignite deposits.

Your Committee believe that these are necessary for the proper information of your Honorable House and the full explanation of the evidence submitted herewith, and should this suggestion be adopted, they will feel that with this report and the evidence herewith they will have done all that it was possible to do since the date of their appointment and the receipt of their instructions, to inform your Honorable House and the people of this country upon the resources of *Canada's Great Reserve*.

All of which is respectfully submitted.

JOHN SCHULTZ,
Chairman.

NAMES OF PARTIES WHO HAVE GIVEN EITHER ORAL OR WRITTEN EVIDENCE TO THIS COMMITTEE.

Capt. Craig, farmer, Prince Albert, N.W.T., who has visited the southern border of Mackenzie Basin.

Hugh N. Bain, Esq., M. D., Prince Albert, N.W.T., who visited the southern border of Mackenzie Basin.

Rev. J. Gough Brick, Peace River District, resident of the Mackenzie Basin.

Hon. William Christie, Brockville, Ont., formerly Inspecting Chief Factor in Hudson's Bay Company's service in the Mackenzie River district.

Malcolm MacLeod, Q. C., barrister, Ottawa, Ont., born in Mackenzie River district.

Chief Factor W. J. MacLean, Lower Fort Garry, Man., chief trader, Honorable Hudson's Bay Company, formerly in charge of Fort Liard.

Hon. James W. Taylor, United States Consul, formerly Senator of Minnesota, now resident of Winnipeg, Man.

Hon. Richard Hardisty, Senator, North-West Territories, Inspecting Chief Factor Honorable Hudson's Bay Company, Edmonton, N.W.T.

His Honor Lieutenant Governor Dewdney, Regina, N.W.T., explorer of Upper Peace and Liard districts, west of Rocky Mountains, and Indian Commissioner for the North-West Territories.

His Lordship Bishop Clut, Fort Providence, Mackenzie River, Bishop of Arian-dale, resident for thirty years in Mackenzie Basin.

His Lordship Bishop Lafleche, Three Rivers, Quebec, for many years a resident of the south-east portion of Mackenzie Basin.

His Lordship Bishop Bompas, Mackenzie River diocese, resident of Mackenzie Basin for twenty-five years.

Frank Oliver, Esq., Edmonton, N.W.T., and has visited the southern part of Mackenzie Basin.

Stuart Mulkins, Esq., Fort Saskatchewan, N.W.T., who has visited parts of the district west of Athabasca Lake.

Donald Ross, Esq., Edmonton, N.W.T., has visited various portions of the Mackenzie Basin.

His Honor Lieutenant Governor Nelson, Victoria, B.C., has visited parts of Mackenzie Basin west of the Rocky Mountains.

Prof. Saunders, Director of the Central Experimental Farm, Ottawa, who furnished samples of sub-Arctic Russian cereals for trial by the Committee's correspondents on Lower Mackenzie River.

Robt. Bell, Esq., M.D., LL.D., Assistant Director Geological Survey of Canada, surveyor of Athabasca River and explorer of surrounding districts and of west coast of Hudson Bay and interior.

Prof. Macoun, Geological Survey, Ottawa, Botanist to Geological Survey of Canada, who has explored various parts of the district.

J. B. Hurlbert, Esq., LL.D., Ottawa, formerly compiler of Meteorological Charts, Ottawa.

James Anderson, Esq., Winnipeg, has been in Mackenzie River District.

Joseph Wrigley, Esq., Chief Commissioner Honorable Hudson Bay Company, Winnipeg, Man.

Charles Carpmael, Superintendent Meteorological Service, Toronto.

George M. Dawson, LL.D., Assistant Director Geological Survey and Explorer of a part of the Mackenzie Basin.

LIST OF PERSONS TO WHOM QUESTIONS HAVE BEEN SENT.

His Grace Archbishop Taché, St. Boniface, Manitoba.

The Most Rev. the Metropolitan of Rupert's Land.

Hon. Sir Donald A. Smith, K.C.M.G., Montreal.

Captain Craig, Prince Albert, N.W.T.

Dr. Bain, Prince Albert, N.W.T.

Rev. J. Brick, Mackenzie River Diocese.

Hon. William Christie, Brockville, Ont.

William Cuest, St. Albert, Alberta, N.W.T.

Hon. Lawrence Clarke, Chief Factor, etc., Prince Albert, N.W.T.

Henry King, Esq., Fort Kelly, N.W.T.

T. P. Woodsworth, Esq., c.o. Dept. Indian Affairs, Ottawa.

Captain Smith, c.o. Hudson Bay Co., Edmonton, N.W.T.

Judge McLeod, Club Chambers, Ottawa.

Chief Factor McLean, of Hon. Hudson Bay Co., Lower Fort Garry, Man.

Hector McKenzie, Esq., Arctic Voyageur, Winnipeg, Man.

Hon. James W. Taylor, United States Consul, Winnipeg, Man.

Chief Commissioner Wrigley, Hon. Hudson Bay Co., Winnipeg, Man.

Hon. Richard Hardisty, Senator, c.o. Hudson Bay Co., Winnipeg, Man.

Captain William Kennedy, F.G.S., Arctic Explorer, St. Andrews, Man.

Dr. Rae, C.M.G., Arctic Explorer.

The Very Rev. Vicar-General of the Diocese of St. Boniface, Man.

Martin J. Griffin, Esq., M.A., Librarian of Parliament.

Major Mulvey, Alderman, etc., Winnipeg, Man.

Charles N. Bell, Esq., F.G.S., Secretary, Board of Trade, Winnipeg, Man.

George H. Ham, Esq., St. Boniface, Man.

James Taylor, Esq., c.o. Messrs. Lyon, McKenzie & Powis, Winnipeg, Man.

Hon. Colin Inkster, Sheriff, etc., Winnipeg, Man.

Alex. Logan, Esq., ex-Mayor of Winnipeg, Man.

Charles Mair, Esq., Prince Albert, Saskatchewan, N.W.T.

Col. Sproat, Prince Albert, Saskatchewan, N.W.T.

Chief Commissioner Herchmer, North-West Mounted Police, Ottawa, Ont.

His Lordship Bishop Grandin, St. Albert, N.W.T.

Rev. Father Lacombe, O.M.I., Calgary, N.W.T.

John Gunn, Esq., Lower Fort Garry, Man.

Capt. Hugh J. Macdonald, Barrister, etc., Winnipeg, Man.

Ex-Chief Commissioner Grahame, Victoria, B.C.

Officer, Hudson Bay Company, in charge of Fort Alexander, B.C.

do	do	do	Fort Vabine, B.C.
do	do	do	Fort Vermillion, Peace River District.
do	do	do	Little Red River, Peace River District.
do	do	do	Fort Chipewyan, Peace River District.
do	do	do	Battle River, Peace River District.
do	do	do	Dunvegan, Peace River District.
do	do	do	St. John, Peace River.
do	do	do	Hudson's Hope, Peace River District.
do	do	do	Fort McMurray, Athabasca River District.
do	do	do	Isle à La Crosse.
do	do	do	Green Lake.
do	do	do	Lac La Biche.
do	do	do	Lesser Slave Lake.
do	do	do	Fort Yukon, Mackenzie River District.
do	do	do	Fort Simpson, Mackenzie River District.
do	do	do	Fort Liard, Mackenzie River District.
do	do	do	Fort Reliance, Mackenzie River District.
do	do	do	Fort Good Hope, Mackenzie River District.
do	do	do	Fort Rae, Mackenzie River District.
do	do	do	Fort Smith, Mackenzie River District.
do	do	do	Fort Norman, Mackenzie River District.

R. McFarlane, Esq., Stewart's Lake, B.C.

Lieutenant Governor Dewdney, Rideau Club, Ottawa, Ont.

Adam McBeth, Esq., Prince Albert, Saskatchewan, N.W.T.

His Lordship Bishop Pinkham, Calgary, Alberta, N.W.T.

His Lordship Bishop Olut, Diocese of the Mackenzie River, care of Rev. Father Oblate, Visitation St., Pierre St., Montreal. P.Q.

His Lordship Bishop Farand, Isle à La Crosse, via Edmonton, Saskatchewan, N.W.T.

His Lordship Bishop Laflèche, Three Rivers, P.Q.

His Lordship Bishop Bompas, Mackenzie River Diocese, care of the Most Rev. Metropolitan of Rupert's Land, Winnipeg, Man.

The Very Rev. the Archdeacon of the Diocese of Mackenzie River, care of the Most Rev. Metropolitan of Rupert's Land.

Ex-Alderman McDonald, formerly of the Mackenzie River, Winnipeg, Man.

Andrew Flett, Esq., Prince Albert, N.W.T.

Henry Mackenzie, Esq., Mackenzie River District.

Rev. Mr. Carrioch, Mackenzie River District.

Hon. Mr. Hamilton, Peterboro, Ont.

Captain Peter McArthur, care of Duncan McArthur, Winnipeg.

Captain McArthur, Banker, Prince Albert, care of Duncan McArthur, Esq. Banker, Winnipeg.

Frank Oliver, Esq., Editor *Edmonton Bulletin*, Edmonton, N.W.T.
 P. G. Laurie, Esq., Battleford, N.W.T.
 Adrian Neison, Esq., of Bad Throat River, Selkirk, Man.
 Amédée Forget, Esq., Clerk North-West Council, Regina, N.W.T.
 Vicar-General, Mackenzie River.
 J. A. Secretan, Esq., C.E., Winnipeg, Man.
 Walter Moberly, O.E., Winnipeg.
 Rev. John McDougall, Winnipeg.
 Rev. Father Hugonnard, Industrial School, Qu'Appelle, N.W.T.
 Thomas McKay, Esq., Prince Albert, Saskatchewan, N.W.T.
 Molyneux St. John, Esq., formerly Assistant Indian Commissioner, Montreal, P.Q.
 His Honor Lieutenant Governor Nelson, Victoria, B.C.
 Joseph Armstrong, Esq., New Westminster, B.C.
 Henry McKenny, Esq., St. Albert, Alberta, N.W.T.
 Major Bedson, Warden, &c., Stony Mountain, Man.
 Hon. Walter Robert Bown, Ex-Member North-West Council, Ottawa.
 H. J. Moberly, Esq., C.E., care of Hudson Bay Company, Winnipeg, Man.
 Capt. Macdowall, M.P., Saskatchewan, Prince Albert, N.W.T.
 Nicholas Flood Davin, Esq., M.P., Assiniboia, Regina, N.W.T.
 William D. Perley, Esq., M. P., Wolseley, Assiniboia, N.W.T.
 Donald W. Davis, Esq., M.P., Fort McLeod, Alberta, N.W.T.
 A. W. Rose, Esq., M.P., Vancouver, B.C.
 William B. Scarth, Esq., M.P., Winnipeg, Man.
 Hon. Joseph Royal, M.P., St. Boniface, Man.
 T. Mayne Daly, Esq., M.P., Brandon, Man.
 Robert Watson, Esq., M.P., Portage la Prairie, Man.
 Edgar C. Baker, Esq., M. P., New Westminster, B.C.
 David William Gordon, Esq., M.P., Nanaimo, B.C.
 John A. Mara, Esq., M.P., Kamloops, B.C.
 Edward C. Prior, Esq., M.P., Victoria, B. C.
 James Reid, Esq., M.P., Quesnelle, B.C.
 Rev. A. E. Greene, Grenville, Nass River, B.C.
 Rev. Thos. Crosby, Fort Simpson, B.C.
 W. Duncan, Esq., J.P., Metlakatla, Alaska.
 Rev. E. R. Young, Brampton, Ont.
 Hon. A. G. B. Bannatyne, Winnipeg, Man.
 George McTavish, Esq., Colborne, Ont.
 Donald Ross, Esq., Edmonton, N.W.T.
 His Lordship Bishop Worden, Albany, on Hudson's Bay, via Mattawa, Ottawa River.
 Archdeacon Vincent, Albany, on Hudson's Bay, via Mattawa, Ottawa River.
 C. S. Drummond, Esq., President Navigation Company, Winnipeg, Man.
 Vice-President Navigation Company, Winnipeg.
 Hugh Sutherland, Esq., President Hudson's Bay Railway, Ottawa.
 Chief Builder, Athabaska Steamer, via Edmonton, N.W.T.
 Professor Selwyn, C.M.G., Geological Survey, Ottawa.
 Dr. Dawson, Geological Survey, Ottawa.
 Professor Bell, Geological Survey, Ottawa.
 Professor Macoun, Geological Survey, Ottawa.
 Mr. Cochrane, Geological Survey, Ottawa.
 J. B. Hurlbert, LL.D., Ottawa.
 Prof. Saunders, Director Experimental Farm.
 M. K. Dickinson, Manotick, Ont.
 George H. Bradenbury, Ottawa, Ont.
 W. J. Morris, Esq., Perth, Ont.
 Joseph Finlayson, Esq., Prince Albert, N.W.T.
 Rev. Z. Gascon, St. Laurent, Man.

Edouard Richard, Ex-M.P.P., St. Boniface, Man.
 Rev. J. B. M. Genin, Box 1,236, Duluth, Minnesota.
 Rufus Stephenson, Esq., Inspector Colonization Companies, Ottawa.
 William Caldwell, Esq., Winnipeg, Man.
 Robert Campbell, Esq., Elphinstone, Man.
 Harry Hughes Browne, Esq., Toronto (7 Clarence Street).
 Donald Melvor, Esq., Kildonan, Man.
 Rev. Father Seguin, Fort Good Hope, Mackenzie River.
 Charles Carpmael, Esq., Superintendent Meteorological Service, Toronto.

LIST OF QUESTIONS SENT TO PERSONS MENTIONED TO ELICIT INFORMATION REGARDING THE RESOURCES OF THE GREAT MACKENZIE BASIN.

With instructions to forward answers to nearest post office and a direction to "fill in on the above lines your full name, occupation, residence and post office address, and for convenience of reference and comparison please write in your replies opposite the questions, and if more space is needed continue the answers on the back of the same sheet, indicating the connection by reference to the number of the enquiry."

SERIES A.—RELATING TO NAVIGATION AND COMMUNICATION.

1. Please give in your answers all the information which you have obtained by actual travel, or from other reliable sources, and state the particular part of the region to which your answers refer, and give generally the sources whence you obtained the information.

2. Please mention the portions of the various rivers of the region mentioned which you regard as continuously navigable. Give the approximate length of each stream, with depth of water during the season of navigation, the velocity of the current, etc. Give also the kind and size of steamer suitable for such navigation.

3. At what points would it be desirable to connect these navigable reaches by road or railway with other navigable reaches of the same or different rivers, or with lakes, for the purpose of affording facilities for traffic? Give the approximate lengths of land carriage in each of such cases as will be necessary.

4. Give the name and general description of all the lakes of the region which you are familiar with; their extent, depth, harbors, general suitability for navigation, their connection with navigable streams; and if no connection with other navigation, what length of road or railway, and at what points will it be necessary to make such connection. Give also the size and kind of steam or sail craft suitable for these waters.

5. Give all possible information regarding the character of the navigation of the sea coast of this region, with particular reference to the portion adjacent to the mouth of the Great Mackenzie River, the depth of water, the average length of open water, the character of the harbors formed by the different mouths of the river, the navigation of the estuary itself, and the kind of craft suitable for such navigation. Also your opinion as to whether whaling and sealing craft, if built at the head waters of the Mackenzie River, could descend that stream early enough and ascend it late enough to permit of some months of fishing near the mouth of the river.

6. How far is the Athabasca or any of its affluents navigable for vessels drawing 30 inches of water above the mouth of the Clearwater? Is any portion of it suitable for steam navigation? What is the nature of the obstructions?

7. Give the same information regarding the Athabasca and its affluents below the Clearwater, and is the Clearwater itself navigable for steamers?

8. What is the character of the Great Slave River; size, depth, obstructions, velocity of current, craft suitable for navigation, etc.

9. Give the same information regarding the Liard River.
10. Give the same information regarding the Peace River, both to the east and west of the Rocky Mountains.
11. Give general character of the Beaver River and the lakes along the upper part of the Churchill River.
12. Give the same information regarding the Mackenzie.
13. Give all possible information regarding Lake Athabasca, particularly as regards its navigation and generally as regards such of its mines, timber, fish, and other products as are available for transportation by water.
14. Give the same information regarding Great Slave Lake.
15. Give the same information regarding Great Bear Lake.
16. If you know of any other body of fresh water such as the Lesser Slave Lake, give all possible information relating thereto.
17. Can sea-going steamers ascend the Mackenzie? If so, how far and with what draft of water and during what period of the year?
18. Give the Committee all information as to the steamers which are now actually running on the Athabasca and Mackenzie Rivers.
19. Do you know anything as to the west coast of Hudson Bay? If so, please describe it to the Committee.
20. What are the principal lakes and rivers between the west coast of Hudson Bay and the Mackenzie River? What is known in regard to any of these?
21. Give the quantities of rain and the depth of snow at any or all the parts of the Mackenzie Basin which you have mentioned.
22. Give any possible information you can as to the depth to which the winter frosts penetrates the soil at the different places.
23. Please give any additional information upon this portion of the subject which has not been elicited by the foregoing enquiries.

SERIES B.—EXTENT OF ARABLE AND PASTORAL LAND.

24. Indicate generally on a map or otherwise those portions of the region in question which are alluvial and diluvial, and those which are rocky and sterile, generally called barren grounds.
25. What is the nature of these barren grounds? Give the Committee as full information as you can as to this region.
26. How far north have barley and potatoes been grown, and how far to the east and west on various parallels of latitude?
27. How far north has wheat been grown?
28. How far north, east and west have the hardy varieties of Indian corn arrived at maturity?
29. Give the time of planting and reaping at any of the places mentioned in your answers to the foregoing questions.
30. When does spring open in these different localities, meaning by spring the first appearance of flowers?
31. How long before the flowering of plants at any of these places is the ground fit for seeding?
32. What is the average time of ripening at any of the places you have mentioned of wheat, barley, rye, oats, potatoes, turnips, Indian corn, strawberries, gooseberries, and other small fruit?
33. What is the general character of the three growing months, June, July and August, at all of the places you have mentioned?
34. Are there summer frosts during these three months at any of these places? (Meaning by frost, a local white frost.)
35. Are these frosts general or local?
36. Will the settlement of the region make it less liable to such frosts?
37. When do summer rains begin?

38. What is the character of the climate of September and October at the various places you have mentioned?

39. What effect has the intensity of cold in winter upon vegetation?

40. What is the character of the natural grasses of the country in different parts? Compare them with those in the eastern Provinces.

41. Does the wild pea or vetch grow in any portion of this region, and if so, at what places?

42. Is any other plant indigenous that would make good food for cattle other than the natural grasses?

43. What is the character of the soil of the district you mention? Is it clay, loam, sand, etc.?

44. What percentage of the whole area is fit for pasturage, and what area is fit for the production of the more hardy grains?

45. Give your general knowledge of the climate and its effect upon plant life?

46. What insect pest, if any, is vegetation subject to in any portion of the Mackenzie Basin?

47. Do you know of any records which have been kept as to the climate of different localities, and what is your general impression as to the climate in any district you have spoken about? If you have any records please attach them in a separate sheet to the last page of your answers.

48. Do the larger lakes and rivers exert any influence in keeping off the summer and autumn frosts, giving examples, and give dates when rivers and lakes in different portions of these regions freeze over in autumn and break up in spring?

49. What are the prevailing winds of different seasons, and how do they affect the climate?

50. Over what portion of the Mackenzie Basin is the warm effect of the south-west chinook wind felt?

51. In the region under consideration what attempts have been made at agriculture and stock-raising, and with what results?

52. Is there any class of domestic animals which could find food in that region known as the barren grounds?

53. What animals now find sustenance there and elsewhere in the region in question, giving particular information regarding the size, habits, weight, food, value of outer covering of the following animals: Cariboo, musk ox, wood buffalo, moose, elk, and all other animals except those which are carnivorous?

54. Give all information regarding the numbers, localities, quality of covering, habits, and method of capture of the following animals: Lynx, Arctic fox, black fox, silver fox, cross fox, red fox, fisher, wolverine, otter, beaver, martin, mink, ermine, musk rat.

55. Give the amount of shipments of peltries of the foregoing animals during the last ten years.

56. Please state in addition to your other answers all the information you possess in regard to the information sought to be obtained by Series B of these questions, and if you have records bearing upon the climate of the region please copy these and attach them to the end of your communication, and give opportunities you have had for acquiring information.

SERIES C.—RELATING TO FISHERIES, FORESTS AND MINES.

57. Describe the fish existing in all the waters mentioned in Series A of these questions, giving size, weight, quality, species, method of taking, probable increase or decrease, and any other information bearing upon this subject.

58. State particularly all the knowledge you possess of whales and other sea animals in the mouths of rivers or along the coast of the Polar Sea, giving localities, probable quantities, and methods by which they are now taken.

59. Give your view as to the value of these sea coast fisheries, the class of vessels suitable for its pursuit, and the point from which such vessel could sail, with

particular reference to the possible use of the head of navigation on the Mackenzie River as a starting point and depot of supplies.

60. Is there timber suitable for the construction of seal and whaling craft on the head waters of the Mackenzie River proper?

61. Give any further information regarding the fish and fisheries of the region which you have not embodied in the foregoing answers.

62. Please indicate on a map or otherwise the nature and extent of the wooded region. Also the various kinds of trees found there; the size, commercial value, quantity, etc. What would be the best outlet for sending this timber to market in the future?

63. Are there any economic plants of small size in the forest or plains of these regions? If so, state locality, quantity, quality, etc.?

64. Have you any knowledge of medicinal plants used by Indians or others? If so, state fully?

65. How far west and north does the Labrador tea plant extend, and to what extent is it used in these northern regions?

66. What is your opinion of it as a substitute for the Asiatic tea?

67. Please state opposite the different minerals mentioned hereunder, the localities of any of them, the extent of the deposits, the means of export, commercial value, and all other information regarding them: Gold, silver, copper, iron, sulphur, salt, petroleum, asphaltum, gypsum, alum, precious stones, coal, lignite, plumbago, lead.

68. Give all the information you can regarding brick, pottery clay, moulding sand, marble, lime and sandstones, granites, etc.?

69. Give all additional information you can relative to the mineral resources of the Mackenzie Basin which you have not given in reply to the foregoing questions.

NOTE.—The Committee will be glad to receive and acknowledge the receipt of any small specimens of any of the minerals mentioned, if sent from the nearest Post Offices in packages not exceeding two pounds weight, marked "Free." These will be placed in one of the Government offices with your name upon them and such description attached to it as you choose to send with them.

SERIES D.—GENERAL QUESTIONS RELATING TO THE MACKENZIE BASIN.

70. Give all the information you possess as to the breeding grounds of migratory wild fowl; locality, numbers, species, date of hatching, time of arriving and leaving, and all other information bearing upon these points?

71. What kind of wild fowl are considered of the most value in the spring and fall migrations. Are they in great numbers?

72. During the migrations do these birds stop to feed in any of the districts you are acquainted with, and where?

73. What is the food of the different varieties of these migratory birds during the breeding season?

74. Give the time of their appearance in the spring, going north, and their return flights in the autumn, going south, at different places?

75. What is the usual food of these wild fowl after the hatching season is over?

76. Give a list of native berries and fruits in the various portions of the country that you are acquainted with?

77. Has the natural pitch of the Athabasca River any prospective value?

78. What quantity is there of this deposit?

79. Should petroleum be discovered in large quantities by boring wells in the Athabasca region, what would be the best way of bringing it to market?

80. What would be the approximate cost of taking in machinery and sinking—say three wells to the necessary depth to test this important question?

81. Is there any geological evidence that would enable us to trace the gold of the North Saskatchewan to its probable source?

82. Give all information regarding the Indians of the district, the different tribes their localities in the summer and winter, their increase or decrease, the epidemic diseases to which they are subject, and all other information which bears upon their food and bodily welfare?

83. What is the food used by them at different times of the year in different localities, and to what extent have they endeavored to cultivate the soil and with what success? Give the localities and full information.

84. Can you give any reasons for the occurrence of years of comparative plenty and comparative scarcity?

85. What is the cause and nature of disease which periodically kills off rabbits?

86. How many varieties of rabbits are there in the Mackenzie Basin?

87. Are all equally affected by this disease?

88. Give a list of all of the food animals not included in your former answers, their locality, present and future importance, and necessity for protection or otherwise?

89. What effect would the opening up of the Mackenzie Basin to civilized men have upon the Indians of the region?

90. Could their labor be employed much to the advantage of employers and employed, and how far would such employment tend to civilize and make them self-supporting?

NOTE.—In closing these series of questions the Committee will be glad to receive and acknowledge any assistance in the way of information to be derived from original memoranda, journals or other documents, or from little known maps, pamphlets, etc., bearing upon the region to which this enquiry relates; and generally have to request that you will add on separate sheets any information of a general or particular character which is directly or indirectly within the objects of this enquiry. State also your opportunities for procuring information.

THE GREAT MACKENZIE BASIN.

MINUTES OF EVIDENCE.

SENATE COMMITTEE ROOM,
OTTAWA, 3rd April, 1888

The Select Committee of the Senate, appointed to enquire into the resources of that part of the Dominion lying north of the Saskatchewan watershed, east of the Rocky Mountains and west of Hudson's Bay, and comprising the Great Mackenzie Basin, its extent of navigable rivers, lakes and sea coasts, of arable and pastoral land, its fisheries, forests and mines, and to report upon its possible commercial and agricultural value, met in Committee Room No. 2 at 11 o'clock a.m.

Captain CRAIG, farmer, of Prince Albert, appeared and was examined by the Committee as follows:

The CHAIRMAN—As no order of questions has yet been prepared, as was the case last year, it will be for any gentleman on the Committee to put any questions he thinks proper to Captain Craig.

By Honorable Mr. Macdonald, (B.C.):

I think, Mr. Chairman, as you are familiar with the run of this enquiry it would be better that you should ask the questions as regards any information that you wish to elicit.

The CHAIRMAN—I shall ask a few leading questions; unfortunately I am not a practical farmer, but with the understanding that other members of the Committee shall supplement any questions which they think desirable.

Capt. CRAIG—My personal knowledge extends only to the Saskatchewan district, and not very far north, except from hearsay.

The CHAIRMAN—I may explain to you that the draft of the questions which we shall put to all witnesses has not yet been approved by the Committee, but I may perhaps read it with permission of honorable members. The first question is—and this relates more particularly to the questions we shall send by mail:

"In giving in your answers all the information which you have obtained by actual travel there or from other reliable sources, please state particular part of the region to which your answers refer, and the source from which you obtained them." I have no doubt that in that northern region you will have heard a good deal. In the order of the instructions to the Committee the navigation of the region comes first, and if we follow that order we will require to know from you, as far as you can give it to us, the navigation of the Athabasca River and, in addition to that, the best points to connect the navigable waters of that river with the navigable waters of the Saskatchewan by road or by railway.

Capt. CRAIG.—My knowledge as to the Athabasca is so extremely limited that I am afraid my opinion would not be of any value to you. That is a question which I feel inclined to pass over.

Q. In that case it will be of importance, indirectly, to know your estimate of the navigability of the Saskatchewan River? A. The Saskatchewan River is navigable, as regards the Main Saskatchewan and the North Branch, throughout its whole length. The South Branch of the Saskatchewan has been navigated, but the navigation is not certain unless the water is high. It is somewhat obstructed by shifting sandbars and other obstructions.

By Honorable Mr. Sutherland :

Q. Which do you mean ? South Saskatchewan ? A. The South Branch I am speaking of.

Q. Are there any shifting sandbars on the North Saskatchewan ? A. Not to the same extent. There are other obstructions which I shall speak of presently. The settlement of Prince Albert may be said to stand midway on the river from its mouth to its navigable source, west of Edmonton, and the whole stretch westward from Prince Albert is unobstructed and open for navigation in any ordinary season from a date in April until the middle of October.

By Honorable Mr. McCallum :

Q. What draft of steamer do you generally navigate it with ? A. It has been navigated by boats drawing 18 inches when loaded ; but the opinion of those who are best qualified to judge is that lighter draft boats would run every day in summer time, without the slightest trouble, as far as Edmonton.

Q. What are the other difficulties that you spoke of as being in the river, besides shifting sandbars ? A. Eastward the river is obstructed by falls and rapids, the first known as Cole's Falls. It is not a serious obstruction ; the principal obstruction is Grand Rapids near the mouth of the river.

Q. Is the fall very great ? A. There is a fall, I understand, of 27 feet there.

Q. In what distance ? A. There is a portage of about 3 miles and a half to get past it.

Q. Would there be much trouble with the other falls above to get round them by lock ? A. No. The Government has been improving them by taking out boulders out of the bed of the river.

By Honorable Mr. Sutherland :

Q. It is more a rapid than a fall ? A. Yes, it is more a rapid than a fall.

By Honorable Mr. McCallum :

Q. The current is very strong in those rapids ? A. Yes, very strong. The current in the North Branch is not so swift as that in the South Branch ; consequently the water does not remain high in the South Branch so long as it does in the North Branch.

Q. You cannot navigate it above Edmonton any distance ? A. I am not aware that it is navigable any distance above Edmonton, but the boats run regularly to Edmonton in the season. I believe it is navigable for some distance above, but practically it is not navigated.

Q. Shifting sandbars are the greatest trouble in navigating the river ? A. They are more a feature of the South Branch than of the North Branch.

By the Chairman :

Q. What is the character of the country to the north of Prince Albert ? A. It is very similar to what it is to the south for some distance out and between the water shed and the Saskatchewan and that of English River or Churchill there are a great many lakes.

Q. You have said the same general character as to the south ; what do you mean by that ? Flat and alluvial ? A. Yes, and interspersed with wood and bush.

By Honorable Mr. Almon :

Q. What kind of wood ? A. Chiefly spruce and poplar :

By Honorable Mr. McCallum :

Q. Any of large size ? A. Yes, there are lots of sawlogs two feet in diameter. There is a saw mill at Prince Albert.

By Honorable Mr. Almon :

Q. They saw the spruce into lumber ? A. Yes ; they saw spruce and poplar as well, but generally spruce.

By Honorable Mr. McCallum :

Q. Spruce is the most valuable timber you have ? A. Yes.

By Honorable Mr. Macdonald (B.C.) :

Q. What size do the logs average ? A. You can find logs two feet in diameter. They do not average that, but they do grow to that size.

By Honorable Mr. McCallum :

Q. I suppose they average all the way from ten inches up to two feet in diameter ? A. Yes, about that.

By Honorable Mr. Macdonald (B.C.) :

Q. How high do the trees grow without branches ? A. The spruce generally branches down very nearly to the ground, more or less, but they are small branches, and do not interfere with its usefulness for sawlogs. The lumber when cut is not so clear and free from knots as the white pine of this district, but it is suitable for ordinary building purposes.

By Honorable Mr. McClelan :

Q. How large is the poplar ? A. It runs up very nearly to the same size. I have seen it two feet in diameter, but very rarely. There is a good deal of it used for building houses there. The most of the settlers' houses were built of poplar logs when settlement first started. There is also tamarac or larch found there.

Q. Are there different varieties of poplar ? A. Yes, we know them locally as the smooth bark poplar and the rough bark poplar.

By Honorable Mr. McCallum :

Q. The rough bark poplar grows larger than the other variety ? A. Yes, and is more valuable.

By Honorable Mr. McClelan :

Q. Does the poplar carry its size well towards the top ? A. Yes, very well.

By Honorable Mr. Macdonald :

Q. Of what wood do you make your shingles in that country ? A. The shingles are generally made of spruce.

By Honorable Mr. McCallum :

Q. The woods you have mentioned are the principal timber in that district ? A. Yes, these are the principal timbers. There is no hard wood except some small birch. There is plenty of larch, or juniper as we call it locally.

Q. It does not grow as large as the spruce ? A. No, but I have been told that there is elm of considerable size down on the Carrot River, to the south of the main Saskatchewan. That is merely hearsay ; I cannot speak from knowledge, never having seen it.

By Honorable Mr. Chaffers :

Q. Where is the timber generally found ? More along the river ? A. Yes. On the south bank of the North Saskatchewan, where Prince Albert settlement is, there is no wood except small poplar, fit only for fencing purposes. On the north bank it is wooded out for several miles and the way that it seems to grow is right along the river bank. Where I live myself, seven miles from Prince Albert, there is about a mile deep of poplar, some of it large enough for sawlogs, and lots of it fit for fencing. The poplar is next the river, then there is a belt of tamarac, and outside of that is pine.

By Honorable Mr. Alexander :

Q. How large have you seen spruce sawlogs ? A. I have seen the spruce two feet in diameter. We have also a fir that we call locally "Jackpine."

By Honorable Mr. McCallum :

Q. That is not of much value ? A. It is used for firewood principally.

By Honorable Mr. Howlan :

Q. But the main timber along the river is spruce ? A. Yes, and it extends principally west. Mr. Macdowall who has a sawmill there has limits west of Edmonton as well as near Prince Albert.

Q. The spruce is next the river, and then the tamarac comes next to that ? A. Locally the poplar is next the river and then the tamarac. It depends on the configuration of the ground. The tamarac seems to grow in swampy regions principally.

By Honorable Mr. McCallum :

Q. What are the agricultural products of that country ? A. We grow everything that is grown here. I have been there five years, and engaged in agriculture principally, and in that time we have had bad years all the time, except last season.

Q. Was it frost? A. It was drought chiefly, and the rebellion we had one year.

By Honorable Mr. Alexander :

Q. Still you had some good returns? A. Yes, we could manage to live there.

By Honorable Mr. McClellan :

Q. Can you inform us as to the extremes of heat and cold at Prince Albert?

Q. I cannot speak of the extreme cold, from my own observation, further than this, that it has frozen the mercury in my thermometer. Still it is very enjoyable even at that.

Q. It is a dry atmosphere? A. Yes, it is a very dry atmosphere. I was used to the milder atmosphere of Scotland, although it is 250 miles nearer the north pole than Prince Albert, and the mercury was never below zero like that; still we feel the climate very comfortable in Prince Albert when properly clad for it.

Q. Is it extremely hot there? A. The mercury goes above eighty in the shade sometimes.

Q. I suppose you have plenty of mosquitoes? A. We have a few mosquitoes there.

By Honorable Mr. Alexander :

Q. During those five years, have you experienced such blizzards as prevail in Dakota? A. We have never had anything resembling a blizzard since I came to Prince Albert, and I never heard of any; and the best evidence I could give to the people in the old country when writing home to them was, that I never had to thatch a grain stack or tie it down in any way on my farm. There is little wind at any time of the year. There is usually a little blow about April—about seed time.

By Honorable Mr. Almon :

Q. Do your forests suffer from fire? A. They have suffered considerably since I have been there.

Q. Is the tamarac a short lived tree? A. No, I think not.

Q. Have you noticed it die off with a disease? A. No, there is no disease in our country in anything—either in cattle, wood or vegetables. There is no potato disease. We are entirely free from anything of that sort.

By Honorable Mr. Alexander :

Q. From your experience there, do you think that the masses of the population from Scotland would be satisfied on going there and getting land such as you have there and such a climate, provided you had railway communication? A. I should think they would. I happen to know a good deal about Scotland, and I know that the farming population there is in a very bad state, and so are the landlords, because their rentals are being reduced and it does not altogether make the tenant right either, and neither of them is satisfied.

By Honorable Mr. Almon :

Q. Would they express themselves satisfied, even though they were? A. It is a question.

By Honorable Mr. Gowan :

Q. How many years have you been in the Prince Albert district? A. Five years.

Q. Have you noticed the time when spring fairly opens there? A. Yes, very carefully, I think.

Q. In what month? A. I take my data from the seed time; I sowed wheat last year on the 16th day of April, which was a Saturday; and in the previous year on the 19th April.

By Honorable Mr. McClellan :

Q. Would that be on the frost? A. There was frost in the ground, but the surface was sufficiently dry to harrow.

By Honorable Mr. McCallum :

Q. You had soil enough to cover the seed on top of the frost? A. Yes, quite sufficient. The frost has a different effect there from what it has here, on the soil?

By Honorable Mr. Gowan :

Q. What would you say was the average time for seeding during the five years you were there? A. From the 16th to the 20th April.

Q. Have you noticed the flowers there? What kinds are found there? Are they spring flowers? A. I am not very much of a botanist. I see the very earliest is something like a wild crocus.

Q. Have you the anemone? Do you know it at all? A. I suppose I know it when I see it, but I am not very well up in botany.

Q. At what season does winter fairly set in and put a stop to farming operation? A. Last year we were able to plough until the 10th of November.

Q. Does the frost ever go out of the ground? A. Oh, yes.

Q. Is frost not found at all times a certain distance below the surface? A. No. I believe that away north, towards the Yukon—I have been told since I started from Prince Albert this time—that the frost does not go out of the ground altogether at any time; that it is covered with a thick coating of moss which prevents it from thawing out.

Q. I am told that in the Saskatchewan district, some three or four feet under the surface of the ground the frost never leaves, and the effect has been beneficial, because the heat of summer draws the moisture up? A. It is not the case in our district. We have vegetables, which grow very deep, such as parsnips, which grow three feet down into the soil.

Q. How deep does the frost enter the ground in the winter? A. I am not sure that I can exactly say as to that, because I have never seen it dug into in the winter; but it is all out of the ground about the time that we begin to fence. We cannot drive pickets if there was any frost in the ground. The fences there are made with pickets and rails—zig-zag fences—and we must drive the pickets in 15 to 18 inches, and if there is any frost in the ground we could not drive them. We fence after the grain is half a foot high.

Q. What kind of water have you there? A. We have good water all over the district.

Q. How deep do you require to dig your wells to get pure spring water? A. I have a well myself which is only 8 feet deep, and a neighbor of mine has one 22 feet deep.

Q. You reach the gravel then at eight feet? A. No, it is a kind of white sand where the water comes. We can scarcely touch gravel at all except down on the flat beside the river.

By Honorable Mr. Alexander :

Q. Has the potato crop round Prince Albert been a success generally? A. Yes, every year.

By Honorable Mr. McClellan :

Q. You speak of no disease being known there? A. There is none.

By the Chairman :

Q. No potato bug? A. No, none at all.

By Honorable Mr. Gowan :

Q. Has the farmer there no enemy at all? A. Yes, the early frost in the fall.

By Honorable Mr. Alexander :

Q. When does the early frost come? A. The year I went out there, in 1883, it came on the 24th August. Since then I have observed it every year, and the earliest that I have found it has been the 17th August, and the latest the 1st of September.

Q. What is the yield of the potato crop per acre? A. I think it is quite safe to call it 350 bushels.

Q. And turnips? A. Double that—that is Swedes. I got first prize for Swedes at the local fair this year.

Q. Do you grow carrots? A. Yes, I grow all kinds of carrots.

Q. What kind of carrots do you find succeed there—the red or the white? A. I have grown them both, and they grow very well. All kinds of root crops grow very well with us.

By Honorable Mr. Gowan :

Q. Have you grown celery? A. I have not grown it in the district, but it is grown. I have grown cabbage, beets, turnips, onions, parsnips, pumpkins and melons.

Q. And all do well? A. All, except the last two I have named have done well.

Q. The melons? A. I am not very sure about them.

Q. Do tomatoes ripen? A. They do ripen. I have not grown them myself, but they ripen.

By Honorable Mr. Almon :

Q. Is there an early frost that ever destroys the grain shortly after it is up? A. We have it more or less touched sometimes, but it does not injure it—it throws it a little back. I had some barley frozen in the spring, but it was so very heavy a crop latterly, that it all lay down.

By Honorable Mr. Sutherland :

Q. Did you notice the early frost injure the wheat any? A. It does not injure it at all. In fact I have observed that the wheat stands frost better than either oats or barley.

By Honorable Mr. Gowan :

Q. Where is the market for your surplus products? A. We have not any at all, and we cannot sell our grain at all.

Q. What do you do with it? A. I do not know what we shall do with it ultimately, but we are down here now trying to get a railway to carry it away. That is the object of our being here.

By Honorable Mr. Sutherland :

Q. I notice in the papers here that wheat was selling at \$1.50? A. That was at Edmonton. The price of the best wheat (No. 1) at the Hudson's Bay Company's mill—the Hudson's Bay Company were the only purchasers, at least for cash—was at the commencement 70 cents per bushel for No. 1, 60 cents for No. 2, and 55 cents for No. 3. I understand about the time we left Prince Albert they had decided to reduce the price, as the market is overstocked.

By Honorable Mr. Macdonald (B.C.) :

Q. How far are you from the railway? A. I believe in a direct line we are 210 miles from Regina, but the mail line by which all traffic goes is 270 miles.

Q. You could not possibly get your grain to the railway? A. No, the freight would kill it altogether.

By Honorable Mr. Alexander :

Q. What do you do with your surplus barley at present? A. What I am doing with it is to crush it and feed it to the pigs and cattle.

By Honorable Mr. McCallum :

Q. How do you account for the price of wheat being so high at Edmonton, when it is an agricultural country there? A. They seem to have had a small crop of wheat this year. It is a mere question of supply and demand. It has been as high as \$2 at our place. At one time before the Pacific Railway was built, Prince Albert was a centre for supplying a great part of the West Saskatchewan Valley—Battleford, Edmonton, and northwards as well—but when the Canadian Pacific Railway went through, they found shorter waggon routes, and Battleford now gets its supplies from Swift Current, and Edmonton from Calgary. That cut off Prince Albert entirely.

By Honorable Mr. Alexander :

Q. From all your knowledge of the surroundings there, what percentage of the land is really good, fair land for agriculture, taking the barren parts with the more fertile? A. In our district, immediately between the rivers, the land is not all arable, but it is all valuable either for ploughing or for pasturage.

By the Chairman :

Q. That is south of Prince Albert? A. South of the Saskatchewan.

Q. The Committee is more anxious to ascertain the character of the country north of the Saskatchewan? A. As I mentioned before, the character of the land to the north is very similar to that south of the Saskatchewan.

Q. What is the distance between Prince Albert and the nearest navigable water—when I say navigable water, I mean for boats drawing 30 inches—on the Beaver River? A. I could not tell that.

Q. Could you tell me approximately? A. There are navigable lakes, about 100 miles to the north.

Q. Flowing into the Beaver River? A. I understand the outlet is towards the Churchill or English River.

Q. That is within the district that forms the subject of our enquiry? A. Yes.

Q. We understand that the distance from Prince Albert to navigable lakes within the scope of this enquiry to be about 100 miles? A. Yes.

Q. What is the character of the watershed between these two places? A. I understand there is nothing in the nature of hilly ground. It is more a flat, and people who go out there can hardly tell you which way the water flows. I believe the Churchill itself is more like a chain of lakes than a river. It is very clear water.

Q. Do you know whether the navigable lake that you speak of connects with other navigable lakes forming the chain of the Mackenzie River? A. I believe there is such a connection, but I am not acquainted with it at all.

By Honorable Mr. Alexander :

Q. Are the fish of those lakes and rivers valuable articles of food? A. Yes, the fish in certain of those lakes are very plentiful—in Trout Lake, Gull Lake, and several others.

Q. Are they caught of a good size? A. Yes, lake trout run as high as forty pounds, although that is an unusual size, and whitefish have been caught as high as nine and twelve pounds, though that is not a usual size.

By the Chairman :

Q. Do you refer to the lakes north of the Saskatchewan? A. The lakes between the Saskatchewan and English River—north of the North Saskatchewan.

Q. You mean by the English River, the Churchill? A. Yes, the Churchill. It is quite customary for the half-breeds in my own immediate neighborhood, to go out every winter on sleighs and stay two or three days and come back with loads of fish.

By Honorable Mr. Gowan :

Q. Do the half-breeds of your neighborhood apply themselves to farming at all? A. Yes, more or less.

Q. Are they successful? A. Some of them are. They have been more given to freighting and fishing and hunting than to farming hitherto.

Q. Are they teachable—are they willing to profit by the knowledge and experience of others? A. Yes, a number of them are well educated men and are quite up to date in their ideas. They are not all so. Those who live in my immediate district are English speaking half-breeds. On the South Branch there are a great many French speaking half-breeds.

By Honorable Mr. Alexander :

Q. Would hardy breeds of sheep be successful there? A. Yes.

Q. What breeds would be best adapted for the country? A. We have merinos and southdowns.

Q. And Leicester? A. Yes, I have a few of all these kinds myself, and crosses of them.

By Honorable Mr. Almon :

Q. Do you not find the bears and wolves troublesome? A. The wolves kill a few of them.

Q. Many? A. Not many. I had three killed this winter.

By Honorable Mr. Macdonald (B.C.) :

Q. Do you find a market for the animals you feed? A. No, the local market is overstocked. Just before I left beef cattle, three years old, fit for killing, were offered for \$35 a head and not finding purchasers?

Q. What would that be by the pound live weight—2 cents? A. I suppose so?

By Honorable Mr. Gowan :

Q. What kind of wolves have you there—large or small? A. They are chiefly small wolves, but there are some large wolves that we call wood wolves. Foxes have been numerous this winter and that we understand to be due to the scarcity of rabbits. The rabbits in certain years increase enormously and you can kill hundreds

if you have a mind to do it everywhere, and it has been found by those who have been there for years that they seem to die out in some way once in seven years.

By the Chairman:

Q. What is the cause of that? A. It seems to be a disease. I have seen some that had a kind of swelling about the throat. That is the only way it can be accounted for on reasonable grounds I think.

Q. You have spoken of the timber north of Prince Albert and within the region of this enquiry. How far north of Prince Albert do people bring sawlogs down? A. They have not got them far out yet, because it has not been necessary.

Q. How far out could they cut them? A. They could cut them I fancy 20 miles out. There are two creeks that they float them down, Red Deer Creek (but that is a very common name and does not convey anything) and Sturgeon Creek. Logs have also been cut since the settlement was first made on some islands in the river—Gunn's Island, Badger Island, and others.

Q. You were speaking of the frost, and you said, if I remember right, that you had frost sometimes as early as the 17th of August? A. Yes; that is the earliest I have observed personally.

Q. You have mentioned also that wheat was often put in on the 17th of April? A. Yes.

Q. That would be 94 days between the placing of the seed in the ground and the first frost? A. Yes.

Q. Do you know any variety of wheat that will ripen within that period? A. In dry years, such as we have had—take 1886 as the most recent—it did ripen within that time—the Red Fife.

Q. Have you made any experiments with the Russian wheat that the Government have been distributing through the Experimental Farm? A. No. I have had samples of Ladoga wheat sent me this spring to experiment with.

Q. What is the period necessary for the growth of this wheat? A. They claim that it ripens 10 to 14 days earlier than Red Fife.

Q. In that case, if it were true that wheat sown on the 17th April would be ripe that many days earlier, it would be in no possible danger from early frosts? A. No; that is all that is wanted.

Q. What is the effect of frost upon the agriculture of the region—I mean by that the deep penetration of the frost, whether it affects the growth of plants, to your knowledge, or whether instead of that it is an assistance to their growth in years of drought? We want that from you as a practical farmer? A. Do you refer to the growth of cultivated plants?

Q. I do? A. The only grain that is really damaged by frost seems to be wheat, and in certain years there is no doubt whatever that it has been more or less damaged by frost.

Q. I mean the winter frost; what effect has the deep penetration of that upon the growth of wheat? A. We think beneficial. The theory is—and I fancy we have seen it in practice—that the ground being quickly frozen, and as I explained in the early part of this examination we sow on the frost, ploughing our land in the fall, we can harrow it much sooner than we can plough in the spring and get the seed in, and the gradual thawing of the frost supplies moisture to the plant, and by the time that is exhausted in the natural course of things we expect to have rains, and generally speaking we have them in the spring. There is a unanimous belief that this deep frost is an advantage to grain growing.

Q. In coming out of the ground, has it the effect of breaking up the soil? A. It never heaves at all.

Q. I mean does it pulverise the soil in coming out? A. It has no noticeable effect on ploughed ground at all. Very often we have this chinook or south wind blowing and it leaves without creating a flush or a flood. It leaves a slippery coat on the surface, and very soon after the snow disappears, and the ground is harrowed very easily.

Q. Have you seen the effect of the chinook winds as far west as Prince Albert? A. Yes; it is very marked.

Q. And how far north? A. I cannot say as to that. It does go north, and we have been told by those who have travelled in the Peace River country, reliable men, that the climate there is quite as good as ours, although it is considerably further north. I have not been there myself and I only speak from hearsay, but I get my information from reliable persons.

Q. I think I am speaking the feeling of the Committee when I say that the information you have given of your own knowledge is very valuable, but we do not wish to confine you to that. You must have had conversation with Hudson's Bay Company men, missionaries and others living north of you, and you are quite at liberty to make statements giving information derived from such sources? A. I have heard that spoken almost universally of the Peace River District by men who have been there, Hudson's Bay Company's servants and others.

By Honorable Mr. Alexander:

Q. In the absence of a railway, what employment could laborers expect to receive at Prince Albert now? Would there be much employment for agricultural laborers coming from England, Scotland and Ireland now? A. The thing has come to be in a different position this year from what it was before, but up to this last crop and while this crop was being taken off the ground, there was a scarcity of agricultural laborers. It is difficult to hire men, and the common wages paid in our district was \$80 per month and board—that is practically \$1 a day and board.

By Honorable Mr. Gowan:

Q. You have referred to summer frost hurting the wheat: does that same frost which injures the wheat affect the potato or the beet? A. It does not affect the beet, but it does affect the potato, so far as the top is concerned, but the potato is generally nearly ripe.

Q. It is only partially injurious? A. It is a temporary, not a permanent injury. It does not injure the tuber, but has a sensible effect on the top.

Q. The beet is usually considered more tender with us and we find that a frost which affects the beet seriously does not injure the potato so much? A. I have not found it so. I grow beets of several varieties, and last year I allowed them to remain on the ground until they were almost frozen in. In the case of Swedish turnips they were actually frozen and thawed two or three times but they were not injured at all.

By Honorable Mr. McClellan:

Q. You spoke about the value of wheat; what is the market value of potatoes and other vegetables? A. The highest price I have seen potatoes bring there since I went to the district, was \$1 a bushel. That was a year when there was a small crop.

Q. That is the local market? A. The local market entirely. I think they were \$1.25 ultimately, or something like that. This year the crop, like other crops, was large and there was no outlet for them almost at all. The price began about 40 cts. a bushel, and was down I dare say to 15 cts. a bushel, paid to those who choose to sell. I had a considerable crop myself and did not know what to do with them. I made an outside cellar and put 300 or 400 bushels in there and fed the balance of them.

Q. You would consider, I suppose, from the tendency of your testimony, so far as the Prince Albert District is concerned, that cattle feeding would be, after all, the most permanent and profitable business for the farmer? A. There is a certainty in it. There is no risk; we have no diseases of cattle. We do not profess that cattle can winter out there the way they do at Calgary. Ranching on a small scale, providing winter feed for the cattle, is very safe. There is never any trouble in wintering at all.

By the Chairman:

Q. What is the population of Prince Albert settlement—taking the settlement as Fort à la Corne—that is, Prince Albert and the adjacent settlements—what is the farming population? A. The population, the municipality included, is put at about 5,000. I believe it is something over that.

Q. You notice on this map the line of the Manitoba and North-Western Railway indicating that it is located a certain distance. Supposing that railway had been

built before you put in the crop last year, with the knowledge you possess of the yield—supposing these people could have found a market, how much grain, wheat and other cereals and root crops fit for exportation could you have raised in the district you mentioned? A. I should estimate—it is a mere guess however—that the present population, with a year's notice, might serve the local market and export something like 100,000 bushels of wheat alone. I have only thought of it as a rough guess.

Q. How much of cereals of all kinds? A. The yield of oats and barley is larger than of wheat, but I premise that we would have to have a year's notice to prepare. The reason why I say so is only half the ground has been cultivated—that is broken up and cultivated and gone back—only about one-half has been in use during the last year or two. This plethora that was to take place was foreseen, and thoughtful men did not put in large crops, but the present population could double their output at once almost.

Q. That is to say the oats and barley would be double the quantity of wheat? A. Yes.

Q. That is a rough estimate of 300,000 bushels? A. Yes, with a year's notice.

Q. How far in the direction of Prince Albert has the railway already been built? A. To Langenburg, 180 miles from the junction with the Canadian Pacific Railway.

Q. How far is that from Prince Albert? A. In a straight line it is 270 miles.

Q. By the surveyed line? A. About 300 miles.

Q. When do you hope to have that railway into Prince Albert? A. I am afraid it is not so much "hope" as despair that has taken possession of us.

By Honorable Mr. Almon:

Q. When you went there in 1882 what was the population of the Prince Albert district? A. It has increased somewhat, notably in the town, but the population in the surrounding country has not increased except by natural increase. That is to say there has been very little immigration.

By Honorable Mr. Gowan:

Q. What about the health of the locality? A. It is a very healthy place?

Q. How many doctors have you? A. We have two.

By Honorable Mr. Almon:

Q. And how many lawyers? A. We have five or six of them.

By Honorable Mr. Gowan:

Q. Are there any diseases peculiar to the place? A. No, I am not aware of any at all. I know my own family have been very healthy.

By Honorable Mr. Almon:

Q. Is there small-pox among the Indians or half-breeds? A. There has been no visitation of it since I have been there. I believe some of the half-breeds and Indians are not of robust constitution. Scrofula seems to prevail among them to some extent.

By Honorable Mr. Alexander:

Q. What about the probable supply of fuel in the event of a large population going in there? I suppose you will depend upon coal? A. Coal is at present worked at Edmonton. There are also indications of coal immediately below Prince Albert, and we are told that it is to be found to the north.

By the Chairman:

Q. At what place? A. I believe on the Athabasca and the Peace River there are indications of it and also of mineral oil or petroleum.

Q. Has asphaltum been found? A. Yes.

Q. And salt? A. Yes

Q. And gypsum? A. Yes; I believe so. We have heard of all these from people who have been there.

Q. Have brick and pottery clays been found? A. My colleague who has gone home says he has seen moulders' sand on the Saskatchewan. It is a valuable article, inasmuch as it is found in very few places on this continent. There are also indications of iron near the Saskatchewan. There are springs very much impregnated with iron.

Q. Have you heard of sulphur being found round the Athabasca? A. I believe I have heard of sulphur, and I have seen gold that came from there. I also saw coming down this time a man, at one of the stopping places on the prairie, with samples of gold quartz that he had brought from the Yukon, 200 miles within the boundary—that is in the region covered by your enquiry.

Q. I once had a specimen of amber from the neighborhood of Great Silver Lake. It was got on one of the Franklin expeditions. Have you heard of any being found? A. No.

By Honorable Mr. Macdonald:

Q. Have you heard of lime or gypsum being discovered? A. The lime used in the district of Prince Albert is made altogether from boulders. There is a large deposit of boulders on both sides of the river exactly on the flat at which Prince Albert is built, and although there is a considerable quantity out every year and burnt, it never seems to decrease, and on the Red Deer Hill, which is a small elevation between the rivers six miles from the town of Prince Albert, limestone is dug out in detached pieces. It is not stratified.

By Honorable Mr. McClellan:

Q. Does it make white lime when it is burnt? A. Yes.

Q. How about gypsum? A. I do not know that it is found there at all.

Q. Is freestone found in that country? A. No; we have no rocks of that kind at all.

By the Chairman:

Q. The soil is all alluvial? A. Yes.

Q. Have you reason to believe that that character of soil extends a considerable distance to the north? A. Yes; as far as I understand from travellers, surveyors and freighters the soil is very much the same.

Q. Do you know anything, from reliable information, of this immense region called the barren grounds? A. No; it seems to be very much unknown to those who are in our district. As to the Mackenzie River, we have parties resident in Prince Albert who are very capable of giving information. I remember one man in particular who I think would give you some interesting information—Mr. Andrew Flett, of Prince Albert. He was 40 years on the Mackenzie River in the Hudson's Bay Company's service. He is married to an Indian woman, and they are both very intelligent. Speaking of the coal on the river, it is so easily mined at Edmonton that the price is very moderate. It is sold in Edmonton, delivered there for \$1.75 per ton. It could be freighted all over the river district.

Q. What is the rate of transportation from Edmonton by river? A. There is none brought down. It is brought as far as Battleford.

By Honorable Mr. Macdonald:

Q. What is the quality of that coal? A. It is pretty good.

Q. It is soft coal, of course? A. Yes.

Q. Is there much slate or shale in it? A. No; it seems to burn very clean. It does not give much flame.

The Committee adjourned until to-morrow.

WEDNESDAY, 4th April, 1888.

Dr. HUGH BAIN, Prince Albert, N.W.T., called and examined.

By the Chairman:

Q. You were present yesterday, I think, when we informed Capt. Craig that while we would like to have evidence derived from actual observation and travel through the country, yet we wished to obtain information all the same even if it came from other sources that you considered reliable; so that we will not confine you to that portion which has come directly under your own observation. You were present to-day when the list of questions was read to the Committee? A. Of course,

nearly all these questions refer to the Mackenzie River country, and of that country I have no personal knowledge. We in the Saskatchewan country are merely on the very verge of that great territory, and I can really give very little information.

Q. As we have not yet got in print the class of questions referring to the agriculture of the district, we will proceed as we did yesterday by any member of the Committee asking you for information regarding the locality with which you are acquainted, and beyond Prince Albert to the north especially. In what part of the North-West do you reside? A. I reside at Prince Albert, N.W.T.

Q. How long have you lived at Prince Albert? A. About eight years.

Q. To what extent east, west and north have your travels extended? A. Eastward on the Saskatchewan I have been down to the mouth of the river; westward on the Saskatchewan I have been only a short distance past Battleford. In a northerly direction I have been, perhaps, 100 miles, more or less, north of the river.

Q. Will you state to the Committee generally the character of the country to the north of Prince Albert, mentioning specially the character of the land suited for agriculture, the timber, the fisheries, and any metals that you know of? A. Immediately north of us we have a large belt of timber, chiefly spruce, and also a good deal of poplar. As you proceed in a north-westerly direction you come into a very fine open country, plains interspersed with bluffs of timber, a country very well suited for grazing certainly and in all probability for grain growing as well. There are several Indian reserves up there. To the north in the immediate neighborhood of Prince Albert there are three Indian reserves, and the Indians on those reserves have proved that the land is quite suitable for agriculture, as they are really the most prosperous Indians we have in the Saskatchewan district. Atahkacoop, chief of one of the reserves, and Mistawasis, chief of another reserve, they were the two loyal chieftains during the rebellion. The third reserve to the north is Petaquaqua. The Indians on these reserves are all succeeding fairly well. For several years past they have raised quite a quantity of grains of different kinds—wheat, oats and barley and roots. They have quite a large amount of stock in the way of horned cattle and also a number of sheep, and have proved the adaptability of the country as far north as that, at least for agriculture.

By Honorable Mr. Almon :

Q. How far north of Prince Albert did you see agricultural products growing? A. I fancy about 100 miles north—as far north as I was in fact—away up on Devil's Lake.

Q. It might be suitable to grow these products further north? A. Of course they are grown further north—at Green Lake and other places.

By Honorable Mr. Howlan :

Q. But you have been no further north? A. No.

By the Chairman :

Q. Can you give us a list of the grains, roots, fruits and grasses that you know are produced 100 miles north of Prince Albert? A. Wheat, oats, barley, potatoes, parsnips; nearly all the small garden stuff that is to be found; carrots, peas, beets and garden stuff generally that is grown. In the way of fruits they have the small berries, strawberries, raspberries, cranberries and these saskatoon berries are to be found in abundance; and then we have the same quality of grasses that we have in the immediate neighborhood of the Saskatchewan River—prairie grasses that are grown there.

Q. Have the Indians tried the hardy variety of Indian corn? A. They have a species of corn—small corn—that they grow and are able to bring to maturity.

Q. Do you know how much further north that kind of corn has been brought to maturity? A. No; I cannot answer that.

By Honorable Mr. Almon :

Q. When you say that corn comes to maturity, do you mean that it hardens? A. It does not ripen—at least I have never seen it ripe.

By Honorable Mr. Howlan :

Q. What distance north of Prince Albert is this timber belt? A. The true forest just touches the river at Prince Albert, north of the river.

Q. How far does it extend along the river? A. It does not extend far westward; it goes more in a north-west direction from Prince Albert. To the eastward for some distance east of Prince Albert, down to the Forks, a distance of about 30 miles, the land is very good; and from that down to some place about Fort à la Corne, the land is very good. East of that along the river, the land is very low and swampy, what I have seen of it, and so far as I have been able to learn from those who know of it, it is quite unsuitable for cultivation.

Q. Are there any indications of coal? A. Indications of coal have been found around Prince Albert, but no tests have been made, and it has not been developed at all.

By Honorable Mr. McCallum :

Q. Are there any lakes north of Prince Albert within a distance of 100 miles north? A. There are a great many lakes. The Indian reserve of Atahkacoop is on Sandy Lake.

By the Chairman :

Q. Sandy Lake is distant how far from Prince Albert? A. I suppose Sandy Lake would be about 75 miles. I have been some little distance north of that, to a lake further north.

Q. Do the waters of that lake find their way northwards into Churchill River? A. I fancy not; I will not speak positively.

By Honorable Mr. Alexander :

Q. What is the most extreme northern point you have been? A. About 100 miles north of Prince Albert.

By the Chairman :

Q. The waters of those lakes find their way into the Beaver River? A. Yes.

Q. Is there a chain of the Beaver River and lakes through which the Hudson's Bay Company used to transport four ton boats? A. Yes.

By Honorable Mr. Alexander :

Q. Is there any white population in the region 100 miles north? A. Yes, there are quite a number of families of half-breeds and a few white settlers round those lakes.

Q. Do any of these families cultivate potatoes 100 miles north of Prince Albert? A. Yes.

By the Chairman :

Q. Can you give us a list of the fishes of that northern district? A. The fish that are generally found there are the whitefish and lake trout.

By Honorable Mr. Alexander :

Q. How large are the whitefish? A. They will average perhaps 3 lbs.; but I have seen them weigh up to 12 lbs.

Q. Of good quality? A. The finest whitefish I have ever seen in my life. They are better even than those from Lake Superior.

By the Chairman :

Q. What is the variety of trout? A. Lake trout, weighing from 5 lbs. up to 40 lbs. I have frequently seen them weighing 25 and 30 lbs.

By Honorable Mr. Alexander :

Q. They are a good nourishing food? A. Yes.

Q. What is your opinion from what you have observed altogether of Indian tribes of the practicability, in the course of time, of bringing those Indians and their children to cultivate the soil? A. Judging specially of the Indians from these reserves on the north of the river, I certainly think they could be trained to agriculture.

Q. You think that in the course of thirty or forty years the descendants of the tribes there at present could be brought to farm successfully? A. Yes, I am fully of that opinion, judging from what I have seen on those reserves. The finest barns that I have seen on the whole Saskatchewan country are to be found there. They are built of course by the Government, but the Indians appreciate them and are careful in the management of their stock, and are endeavoring to farm and have been farming with fair success.

By Honorable Mr. Almon :

Q. Where were those Indians brought from to the reserves? A. From the plains.

Q. How far south from that? A. Of course, the plains come right up to Carleton. Carleton used to be, in the days of the buffalo, the headquarters of those Indians, and they used to hunt southward several hundred miles.

Q. Their occupation prior to the extinction of the buffalo was that of hunter? A. Yes.

By Honorable Mr. Alexander :

Q. You think that half-breeds can in course of time become perfectly successful farmers? A. Certainly.

Q. The French as well as the Scotch half-breed? A. Certainly.

By Honorable Mr. Almon :

Q. How many years are the Indians settled on those reserves? A. I should say eight or ten years, or something about that. Those Indians, on those reserves, were the few Indians in the Saskatchewan district who remained loyal during the whole rebellion.

Q. They are all Christians, I suppose? A. Yes. Missionaries are stationed on the three reserves.

By Honorable Mr. Alexander :

Q. You have had perhaps a better opportunity than many other men of observing the Indians; what would you think of the policy of the Government, finding out sections upon more northern rivers, where the climate and soil will admit of growing potatoes and the coarser grains and transferring many of those tribes from their present reserves to where they will combine all the advantages of agriculture with the hunting of the larger animals which are to be found there, the moose and cariboo and abundance of fish? Do you not think, if that could be done, the Indians would be happier and better, and that it would be a sound policy for the Government to try the experiment? A. I believe that the Indians would be happier, but I do not think that it would be the best way to make farmers of them. I believe that the more the Indian is disassociated from hunting the better it will be for the Government if the policy is to make a farmer of him.

Q. It would be only leaving it to their choice. Supposing a few from different tribes were to be offered their choice? A. It would be their choice no doubt, if it were submitted to them. The Indian prefers hunting to farming, but hunting is now so precarious that he cannot make a living by it, and it would demoralize him.

By Honorable Mr. Almon :

Q. Do the Indians on the reserves have different tribal languages among each other? A. No, they all speak the same language and there is more or less inter-marriage among them. One great objection to having the Indian on the reserve, it seems to me, is that the industrious man is to a certain extent handicapped. The lazy man lives to a very great extent on him. There is a sort of community of goods amongst them.

By the Chairman :

Q. We wish to elicit from you some knowledge of the climate of the region north of Prince Albert; what can you tell us about the different seasons of the year—the opening in the spring, the commencement of cultivation in the spring, the ripening of the grain and summer frosts? A. Spring opens generally some time in April, and from the middle of April, until the first week of May ploughing is commenced. Harvesting is generally done from the second week of August until the first week in September. The summer frost is generally found there from the second to the third week in August. That is my experience in the last eight years.

Q. Does this apply to the country north of Prince Albert? A. This is the country north of Prince Albert country—not the Prince Albert country.

Q. That applies to the country as far north as you have any knowledge of? A. Yes.

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Q. What length of time does it take barley and wheat to ripen in that region?
A. I have frequently heard it stated that wheat will mature in 90 days. I have not much knowledge of farming. Barley would ripen in somewhat less time.

Q. Has any of the seed wheat procured from northern Russia been tried in that district? A. Not yet. Some will be tried this coming year.

Q. Do you believe that this Russian wheat, if it ripens in 84 days, as stated, will always be a successful crop in that region? Will it always evade the autumn frost?

A. Judging from my experience of eight years there, if we can get wheat that will ripen ten days earlier than the varieties we have been trying it ought to be as sure a crop as in any part of Ontario. During the eight years I have been there with the exception of one year, there was no damage from frost early in August.

Q. How does the cold of this region compare with the cold of Prince Albert?
A. Of course the thermometer shows a greater degree of cold in this section, but not any greater than I have seen in Winnipeg.

Q. What is the character of the climate in September and October? A. Generally very bright, clear, open, enjoyable weather.

Q. What is the length of time stock require to be fed in winter? A. Of course from the time the heavy snow falls until the spring, and that time varies a good deal; as a rule, I should judge from November until March.

Q. About what time do the rivers and lakes of that northern region close? As a rule, in the early part of November.

By Honorable Mr. Alexander :

Q. During your experience there have you seen any year that the crops did not ripen from the want of sufficient heat? A. There has never been a complete failure.

By Honorable Mr. Almon :

Q. Are the Indians as long lived since they have gone on the reservations as they were when hunting? A. No, I do not think it;

Q. Is there much consumption amongst them? A. A good deal of consumption and scrofula.

The Committee adjourned at 12 o'clock until to-morrow.

THE SENATE,
COMMITTEE ROOM, No. 17,
THURSDAY, 5th April, 1888.

Dr. BAIN, re-called.

The CHAIRMAN—Your very interesting evidence of yesterday was broken off at the point where you were describing to us certain roots, fruits, grains and grasses which are grown by the Indians to the north of Prince Albert. As we have not yet printed the list of questions so as to give them to you in order, we will commence these questions by directing your attention to the grains which are upon the table in bottles. The first of these is wheat from the Mission at Fort Chipewyan, latitude 58, longitude 111; reaped August 27, 1885; weight 68 lbs. to the bushel.

The second is black beans from Dunvegan, latitude 56, grown by the Rev. Mr. Tessier in 1876.

The third is wheat and barley from Dunvegan, on Peace River, latitude 56, longitude 118.

The fourth is oats from Lake St. Anne, 60 miles north-west of Edmonton, and in the Mackenzie River District.

The fifth is wheat from the same place.

The sixth is barley from the same place.

The seventh is Fyle wheat from near Edmonton, grown in 1879.

The eighth is club wheat from Edmonton, grown in 1879.

The ninth oats, the tenth and eleventh barley, the twelfth and thirteenth wheat from Fort Saskatchewan, near Edmonton.

I may say that all these specimens, with the exception of one, are from within the district which is the subject of our enquiry, and I direct your attention to these grains to ask you how they compare with the grains that you described to us yesterday as having been grown by the Indians at a lake on the northern side of the Saskatchewan watershed.

Hon. Mr. MACDONALD (B.C.)—Is this within the Mackenzie River Basin?

The CHAIRMAN—Yes.

Hon. Mr. McINNIS (B.C.)—Where do you claim the Mackenzie River Basin begins?

The CHAIRMAN—At the south, at the height of land between the streams that flow south to the Saskatchewan and those that flow north to the Athabasca River, which is the fountain head of the Great Mackenzie.

Dr. BAIN—These samples resemble very closely the grains which we grow in the Saskatchewan District, even among the Indians. I am not a practical farmer and I cannot speak with the weight of authority on the subject. I have seen grain quite as good as any of these samples grown in the Saskatchewan country. This sample of wheat, weighing 65 lbs., judging from the weight, is a very good sample, but it is a very common thing with us to have wheat weighing to the measured bushel 63 and often 69 lbs. The other grains resemble very much in character the grains that we have on the Saskatchewan.

Q. I might explain to you that the package which you had in your hand is part of the sample of wheat which took the prize at the Centennial Exhibition, and is from Fort Chipewyan, which is some distance down the Mackenzie River. It weighs 68 lbs. to the bushel? A. The oats and barley are certainly no better than what we have seen on the Saskatchewan grown by the Indians on the reserves north of the river. That sample of wheat is better than any I have seen on those reserves, but I have seen quite as good grown in the Prince Albert District.

By Honorable Mr. Bolduc :

Q. Do you know what quantity of barley is usually raised to the acre in your district? A. Not being a farmer, I only speak from hearsay; but I suppose about 50 bushels to the acre is a very good yield.

By Honorable Mr. Sanford :

Q. What is the average yield of wheat there? A. It varies very much from year to year; but in a good year we would have 25 bushels to the acre. In some of the dry years of course it is very much less than that.

By Honorable Mr. McInnes :

Q. How often have you a good year? A. We have sometimes two or three dry seasons in succession, and the yield of those years, of course, is small; then there are sometimes for five or six years in succession that we have wet seasons, and during all that period we have very good crops.

By Honorable Mr. Sanford :

Q. Then your average yield is lighter than it is in Manitoba? A. It varies there the same as with us. In dry seasons the average is very much reduced. I am speaking of course of the average. We have had cases where it has run up to 40 and even to 50 bushels of wheat to the acre, but I am speaking of the general average. With us farming is not, perhaps, carried on as well as it is in Manitoba. We have a great many men who had very little knowledge of farming—who had been freighters and hunters, and have gone into farming only recently, and are not farming as well as many of the farmers in Manitoba, and on that account the yield will not be as great, of course, as the country might produce.

By Honorable Mr. Bolduc :

Q. As a rule do you have very serious frosts? A. As a rule we do about the third week in August—that is, judging from my experience of eight years.

By Honorable Mr. McInnes :

Q. During the eight years that you have been up there how many really good harvests have you had, where the wheat crop averaged 25 bushels to the acre? A. In four of the years.

Q. Were those years good years in succession or alternate? A. We had three years in succession, and then last year.

Q. You are speaking now of Prince Albert? A. Yes.

By Honorable Mr. Sanford :

Q. What is the average yield of oats there? A. I suppose, on the average from 50 to 60 bushels to the acre.

By the Chairman :

Q. What diseases prevail among the Indians to the north of the Saskatchewan? A. The chief constitutional diseases that I found amongst them were consumption and scrofula and a small amount of *syphilitic* diseases, but not to any great extent. Then among the other diseases, about the most fatal disease that they have had the last two years, has been measles. It has carried off a great many of them. They contract the disease; it spreads among them; they expose themselves to the cold, and then suffer from complications, and a great many of them die.

By Honorable Mr. Turner :

Q. Does it prevail amongst the adults as well as children? A. A great deal of it is amongst the adult population as well as the children. Skin diseases are quite common amongst them. They suffer a great deal from different forms of disease which are chiefly of a scrofulous nature. Scarlet fever has been among them, but not in the time that I have been there.

By Honorable Mr. McInnes :

Q. Does small-pox exist amongst them? A. It has not been among them during my time there, but in 1871 and 1872 it prevailed very extensively, and carried off immense numbers of them.

By the Chairman :

Q. When I was a young man, like yourself practicing in Manitoba, I found that the Indian method of treatment adopted was the cause of making fatal very many such minor diseases as measles, scarlet fever, &c. I found that the sweating lodge was one of their great resources. If a person was attacked with measles, they would treat him as if suffering from any other case of fever. They would put him in the sweating lodge, heat him up to a very great heat so as to induce a profuse perspiration; then take him out of that and plunge him into the coldest stream they could find, with the immediate effect of preventing the eruptive fever from coming out, followed by death. Has that been your experience? A. To a limited extent, the same treatment is carried out with the same results; but from what I can gather it is not as much used now as it was formerly.

Q. What medicinal appliances are in use by the Indians—I mean what indigenous medicinal plants? A. I can hardly answer that question.

Q. What are their methods of treatment of those diseases that you have described their being subject to? A. The sweating lodge that you have just mentioned is yet not an uncommon method of treatment. They use a great many infusions of roots that they have—I really do not know what many of those roots are.

By Honorable Mr. McInnes :

Q. Do they ever have recourse to charms and incantations? A. That is not in use with the Christian Indians at all.

By the Chairman :

Q. Have you noticed the blood root growing in that district? A. Yes, it is quite a common plant with us.

Q. Do the Indians use it as we use the *radix serpentaria*? A. I am not aware of it.

Q. Have they the gentian root? A. I cannot tell you.

By Honorable Mr. McDonald (Toronto) :

Q. I notice occasionally records of the deaths of very old Indians; are they, as a rule, a very long-lived race? A. Not at all.

Q. I suppose you regard the diminution in the length of life as being superinduced by the introduction of many of our own vices amongst them? For instance, consumption I suppose is really the disease that follows from their connection with

the white man? A. To a certain extent, of course it does. The shortness of life, too, is due a great deal to the circumstances under which they live. In olden days the Indians of whom I speak lived on the plains, and had an abundance of fresh meat. Now they are to a certain extent living on the rations supplied them by the Government—bacon and flour—they live in houses, and they are not very cleanly in their habits. The fresh meat, and their roving life, moving about in tents, added to a certain extent to the longevity of the Indian.

Q. I suppose all the deterioration incidental to syphilis is the result of contact with the white man? A. Certainly.

Q. Altogether? A. Yes, I may say altogether.

By Honorable Mr. McInnes:

Q. Do you treat many of the Indians out there? A. Yes.

Q. Is it, or is it not, your experience that a very large percentage of the cases of consumption and scrofula are really inherited syphilis? A. No, I cannot say that it has been my experience. Of course I have seen many such cases, but I am not prepared to say that the majority of the cases were due to inherited syphilis.

Q. I know that that is my experience in British Columbia—that it is the most prolific cause of the dying out of the Indian population there. I have no hesitation at all in saying that the vast majority of deaths among the Indians is due to inherited syphilis, especially along the coasts. Of course it manifests itself in different forms, but it can all be traced back to that cause. The Indian is dwindling down and is doomed. Fifty years hence there will scarcely be any of them left? A. Syphilis in many cases, doubtless explains the cause of certain forms of scrofula that are found amongst them. Exposure, want of proper food and an absence of cleanliness and change of diet are also among the causes. It is a remarkable fact that the number of children that the Indians have is very small—not nearly so many to a family as you will find among the whites. Polygamy is common amongst some of the tribes.

By Honorable Mr. Macdonald:

Q. Not amongst the Christian tribes? A. No, not amongst the Christian tribes, but amongst the others, and they will have perhaps only two or three children.

By Honorable Mr. McInnes:

Q. Is the size of the families diminishing? A. Yes, year by year.

Q. How do you account for that? A. Chiefly on account of the inherited weakness of the parents, and scrofulous taints.

By the Chairman:

Q. What effect upon the future welfare of the Indians of the Mackenzie River Basin will the opening of that country have? A. Upon these Indians I think the effect of opening up the country will be beneficial. They have already reached such a stage of civilization that the more they are brought in contact with the white people, the more speedily will they become useful citizens.

Capt. CRAIG recalled, was examined as follows:—

By the Chairman:

Q. We supposed that we had concluded with your evidence, but the presence of those specimens to-day leads me to recall you. You are a practical farmer, and we wish to know from you, as far as you can inform us, what extent of the country north of the Saskatchewan watershed will produce grains such as you see in the samples upon the table? A. It is quite impossible for me to say what extent of country will produce them, but I understand this morning from a gentleman who has been in the northern district that barley quite as good as the sample on the table has been produced at Fort Simpson. I am not aware how far north that is, but it is right in the district to which your enquiry applies. I believe that gentleman is likely to be called before the Committee, and will be able to speak on that point himself. I refer to Mr. Anderson.

Q. However valuable his testimony may be, we wish you to go on with your examination of those grains, and give us your opinion? A. This is a very good sample of wheat from Lake Ste. Anne's in 1878, considering the time that it has been in the glass, or somewhere else, ten years. It might be considered something like the average of what we grow in the Saskatchewan, although I do not say it is equal to the best wheat we grow there.

Q. Have you reason to believe that similar wheat can be grown as far north as Fort Simpson? A. I do not know personally.

Q. You have some barley there? A. Yes, this is grown about the same place, in the same year. It is a very fair sample of barley.

Q. Have you any knowledge of how far north of where that was grown it is likely to grow and ripen? A. I believe it grows and ripens several hundred miles further north than Lake Ste. Anne's. This is a sample of oats somewhat mixed and not a first class sample, grown apparently at the same place and in the same year. It is a passable sample, not first class.

Q. How far, in your opinion, can such oats be grown to the north? A. I believe they have been grown much further north than Lake Ste. Anne's from the same information I have received. This is a sample of Fife wheat from Edmonton, grown in 1879. They have grown much better Fife wheat than that at Edmonton since then. This sample of barley, grown at Norway House in 1879, is very good barley indeed, considering where it is grown—a region which we have always understood to have the most severe climate that we have in the North-West.

Q. As a farmer, would you infer that potatoes may be grown as far north as the barley limit? A. Yes.

Q. What other vegetables, roots or grasses would you expect to grow north as far as barley can be produced? A. I think there are varieties of turnips that would grow to the same limit.

Q. And what else? A. I think carrots would not grow so far north—I am not aware of it, however; it is a mere impression.

Q. What other grains that are properly cultivated will grow as far north as the limit of wheat? A. Rye.

Q. What else? A. Rye, oats and barley.

Q. Can you tell us anything of the grasses of that northern region? A. No, not from personal knowledge. I understand from what I have been told that the grass there is very luxuriant and that the pea vine which we have in perfection on the Saskatchewan is also grown there.

Q. Is that what we know as the vetch? A. It is a wild vetch.

Q. The statement is made in one of the speeches that I read somewhere that the growth of the grasses and vetches of the Peace River Valley is so rich that it is difficult to ride on horseback through it? A. They must have been very long vetches or very small horses. I rather think it is exaggerated; but I have seen vetches that have struck me as four feet high.

By Honorable Mr. Girard:

Q. You are a practical farmer in the Saskatchewan district: How many crops have you had since you were there? A. I had a crop every year but one, and that was the year we had a rebellion instead of a crop.

Q. I suppose you have met with some bad crops during the five years you have been there? A. The majority for the five years have been bad—that is to say, there was a partial failure of crops three years out of the five from drought. We had some crop but it was not, speaking as a Scotchman and knowing what crops ought to be, anything but a failure.

Q. Have you suffered with early frosts in the fall there? A. We have both spring frosts and autumn frosts. The spring frosts do no injury. They may throw back the spring work a few days, but they do no injury. The autumn frosts generally come from the 20th to the 24th of August, but in a moderately dry season the crop is ripe by that time and the frost does no injury if the grain does not happen to be out. If as last year we happen to have a rainy season, which continues all through the season, the crop does not ripen early, and it is likely to be injured by frost.

Q. What time does the spring frost strike? A. The spring frost strikes generally about the 1st of June.

Q. Can we rely on wheat crops without danger of frost? A. Yes, if it is sown in proper time. You can rely on good crops of oats and barley every year.

Q. Have you grown pease there? A. I am very glad you have asked me about pease, because they are a very successful crop there. I have grown a good many crops myself, and they have always been successful.

Q. Have you tried corn? A. I have tried, but I should not like to say too much about its success.

By Honorable Mr. McInnes:

Q. Do you grow beans there? A. Yes, some years. Last year they were not a success for the same reason that the wheat was frozen. They do not ripen until late in the season, and the frost is apt to catch them.

Q. Are you speaking now of the frost in the valley or on the high table land? A. My own place is right on the river bank but it is high above the water between the two rivers, the North and South Branches. The ground is very much on the flat. There is very little rise or fall there at all and I do not think any little difference in elevation makes any difference in regard to the frost. Red Deer Hill lying midway between the two rivers is as subject to frost as the lower parts, but very low down near the river the frost is always worst.

Q. The elevation there is not sufficient to make any perceptible difference? A. No.

By Honorable Mr. Sanford:

Q. What is the average yield of pease to the acre? A. I have not grown them in quantities at all. Mine have been garden experiments.

Q. You could not give an estimate? A. It is a large proportionate yield, but as to how many bushels to the acre I could not say.

Q. What is your estimate for wheat? A. My average for wheat was 27 bushels to the acre last year. It is not an estimate, but the actual average.

Q. Have you done better than that? A. No, because as I explained already, we have had three dry years out of five there.

Q. What is your average for barley? A. Forty bushels to the acre.

Q. And of oats? A. Fifty bushels to the acre. These are actual averages. I know of instances in which 100 bushels of oats to the acre were grown last year, but it was very exceptional and would convey a very wrong impression to the Committee to give that as the average. Fifty bushels to the acre is a very safe average to take where there is good farming, but where there is very inferior farming, and we have some of it there, there is a different result.

Q. What is the yield of turnips? A. Six to seven hundred bushels to the acre.

Q. And potatoes? A. Three hundred and fifty bushels.

Q. And carrots? A. We could not get them pulled out of the ground, they were so long.

By Honorable Mr. McInnes:

Q. What has been your average yield of wheat for the last five years? A. It is quite impossible to give a reliable answer to the question, it is so difficult to get information from anyone but yourself.

Q. Taking your own crop? What is it? A. I should not put it much over 20 bushels as the average for the last five years. I know that several parties had a higher yield than I had last year, for my crop was partly frozen.

Q. And the average of other grains that you have mentioned, was it the average for five years, or for the last year merely? A. As Dr. Bain has explained in his evidence, the weather seems to run in cycles. Some seem to say five and some seven years; but from all accounts they seem to have entered upon the cycle of good years, and this average I have referred to would certainly refer to good years.

Q. Have your crops ever been injured by insects? A. Never. We have no grasshoppers or potato bugs or any troublesome insects I may say, but mosquitoes.

By Honorable Mr. Turner :

Q. I understood you to say that in the event of early frosts, there are certain crops which are not affected by frost? A. That is the case—only wheat.

Q. In the event of an early August frost, the only crop that would be destroyed is wheat? A. Yes, late wheat.

Q. And barley, oats and root crops are not affected at all? A. If there is anything late, either oats or barley, it will injure them, but practically with good farming—we must not speak of inferior farming,—oats and barley are past any danger of injury when the first frost occurs.

By Honorable Mr. McInnes :

Q. But in the event of the oats and barley being in the milk when the August frost occurs, would it not injure them? A. Yes, but anybody who has oats and barley in the milk on the 17th August deserves to have them frozen.

By Honorable Mr. Turner :

Q. In the event of wheat being frozen in August can you sow that grain next season, and will it yield a good crop? A. It has been sown, and it germinates very quickly, but I understand that the yield is not to be relied upon. I have never attempted it myself.

By Honorable Mr. Poirier :

Q. Are the crops of wheat you grow there spring or winter wheat? A. Spring wheat altogether.

Q. And it has time to ripen between the 1st June and the 20th August? A. I did not say that. I sowed my spring wheat last year on the 16th April. We have a spring frost that sometimes occurs as late as the 1st June. Wheat ripens in 90 days in a very dry season, and in 100 days in an ordinary season.

Q. Did I understand you to say that those crops will grow 700 miles north of the Saskatchewan? A. Several hundred miles I said.

By Honorable Mr. Sutherland :

Q. Have you experienced any frost severe enough to kill your potato vines if they were up, say in June? A. Yes, I have seen them touched.

Q. Does it kill them? A. It does not injure them at all, so far as I have observed. The tops seem to be more bushy after being touched with frost, but I do not think it injures the roots at all.

Q. I am told that here in Ontario it was the experience of the farmers in early days that potato vines were killed by June frosts? A. I have never seen it with us or heard of it.

By Honorable Mr. Poirier :

Q. Do you grow any buckwheat there? A. No, I have not seen it.

Q. I understood you to say that for the majority of the last five years, the crops were a partial failure? A. For the majority of them they were a partial failure. The majority would have been the other way only for the rebellion. That was a good year, but the farmers of the district were collected in the town of Prince Albert for safety and had their wives and families there. I was myself in charge of a company there which was wholly composed of farmers. I had about 70 or 80 men under me, and we were not allowed to go out to put in our crops until General Middleton came down from Batoche, and that accounted for failure that year. If we had been allowed to put in our crops at the usual time, I think we would have had a good crop.

Q. The season then is uncertain for harvesting? A. The farmers there do not depend on cropping at all. We consider the country adapted for mixed farming, and although we might starve in a bad year if we depended on wheat altogether, we have cattle and hogs and other crops to go upon.

Q. Is the snow very deep there in the winter? A. Not so deep as it is here.

Q. But the cattle cannot feed out of doors all winter? A. No.

By Honorable Mr. McInnes :

Q. How long did you feed your cattle there on the average in the winter months? A. I may say from the end of November to the 1st of April.

Q. Can they pick up a living from the 1st of April? A. They go out then, if they wish to go. Although we give them some feed in April, I believe they might do without it. We generally give them something all through the month of April.

Q. How about the horses? A. The native horse can live out all the year. When we were coming down on this very trip, we heard of a band of native horses on the Salt Plains, this side of Humboldt, that went off during the rebellion in 1835, and they have increased to 23 in number, and amongst them are colts that were never in a stable.

Q. How about fuel? A. We have any quantity of fuel in the forests.

Q. Are the lands that you speak of chiefly level? A. Yes, chiefly level on the river. To the west of us there is also coal. It has not been used in our district, but it has been used in the town of Battleford.

By Honorable Mr. Girard:

Q. Do you think that in time the farmers will have a better average of crops? A. I think so. Mr. Carling and Professor Saunders have informed us that they have this year obtained a variety of Russian wheat, which is grown at a very high northern latitude, and I understand that samples of it have been sent to our district for experiments this year. They claim that it ripens ten days earlier than the Red Fife, if so we can calculate on a crop every year. Ten days are sufficient to insure the crop ripening.

By Honorable Mr. Poirier:

Q. How much do you pay per cord for wood where you live? A. We cut our own wood, and we pay the Government a duty of 10 cents a cord.

Q. But those who have to buy their wood, as we have here in town, what do they pay for it? A. The price is \$1.75 per cord.

By Honorable Mr. Girard:

Q. Have you had occasion to remark that the land after several years cultivation gives a better return than in the beginning? A. Yes, we have always been told since going there, that the conditions were somewhat as they were in the early days of Ontario, and as the land is drained and cultivated the frosts will disappear. We rely, however, on ultimately getting an earlier variety of wheat.

By Honorable Mr. Sanford:

Q. Does stock do well in your country? A. Very well indeed. We can raise horned cattle for very little; but unfortunately we have no market for them. We have come down here to endeavor to get railway connection so that we may be enabled to ship grain and cattle.

Q. Have you an abundance of grass for hay? A. We have an abundance of grass. In wet seasons we have an abundance of ridge hay, and in dry seasons we have an abundance of swamp hay, so that in no year is there any scarcity. We have any quantity.

Q. You reside upon the banks of the Saskatchewan: What proportion of the year is that stream navigable for river steamers? A. The town of Prince Albert stands nearly at the foot of the unobstructed navigation westward, and the river is navigable for a good many miles up west of Edmonton, and it is open from about the middle of April to the middle of October, every year.

Q. Is there a sufficient depth of water during all that time? A. There is a sufficient depth of water for boats drawing not over 18 inches, and if there were boats that drew not more than 15 inches, there would not be a day in the season that the river is not navigable. From Prince Albert east, the river is somewhat obstructed by rapids and falls. The Grand Rapid cannot be navigated.

Q. Is there a large quantity of timber north of the Saskatchewan? A. Yes; the timber is said to extend from the northern shores of Lake Manitoba round to the Rocky Mountains, and the southern verge of the forest touches the river at Prince Albert.

By Honorable Mr. Ferrier:

Q. What is the character of the timber? A. Spruce chiefly and poplar. There is no oak, but there is tamarac and jack pine; the latter is chiefly used for firewood.

By Honorable Mr. Bolduc :

Q. You have white birch, have you not? A. Yes; small white birch.

Q. Does the spruce grow as large with you as in the Province of Quebec? A. I have not seen it growing in Quebec, but I have seen it 2 feet in diameter with us. As I said yesterday, it runs from 10 inches up to 2 feet, and the rough bark poplar averages about the same measurement.

By Honorable Mr. Merner :

Q. You have not tried any fruits there yet? A. Apples have been tried, but they have not been successful. We have several varieties of small fruits; raspberries are very plentiful, and the quality is quite as good as the cultivated varieties. We have also strawberries, a small variety, but they are very plentiful and very good. We have also black and red currants, and gooseberries all growing wild.

By Honorable Mr. Turner :

Q. Have you any plums? A. We have no plums.

By Honorable Mr. Girard :

Q. Have you wild grapes? A. We have no grapes; we have wild cherries.

By the Chairman :

Q. Have you the insect pest known as the pea weevil? A. No; we have no insect pests at all, and no diseases of plants, so far as my observation goes. We are a little troubled with the gopher, the same as they are to the south of us, but it is not worth speaking of at all. It is a sort of a small gray squirrel.

The Committee adjourned until to-morrow.

THE SENATE,

COMMITTEE ROOM No. 17,

OTTAWA, Friday, 6th April, 1888.

JAMES ANDERSON, a native of Fort Simpson, now resident of Winnipeg, appeared and was examined by the Committee as follows:—

The CHAIRMAN.—We are trying to keep the information in order and classify it somewhat so as to assist us in making up our final report, and we have divided this list of questions into three series. The first relates, in the order of the instruction to the Committee, to navigation and communication; the second series relates entirely to the extent of arable and pastoral lands; the third series relates to the fisheries, forests and mines, so that while we may have to ask many other questions arising out of these we will take them in this order. Please give in your answers all the information which you have obtained by actual travel or from other reliable sources, and state the particular part of the region to which your answers refer, and give generally the sources whence you obtained the information? A. Before answering this question I might say to the Committee that I only got your letter last night, and I have not prepared myself to answer your questions fully, and I was really too young when I left Fort Simpson to give valuable information except what I have gained from my father's diaries. Of course I can tell you of what I have seen myself—I can remember all that; but I do not think I could answer those questions fully with regard to the navigation and communication, because I was too young when I left there.

By Honorable Mr. Girard :

Q. Were you born at Fort Simpson? A. No; I was born in the Lake Superior district, but I went up to Fort Simpson with my father in 1852. When I left the Mackenzie River district I was 11 years old, and I remember what I saw growing at Fort Simpson, and what I saw in travelling with my father.

The CHAIRMAN.—The plan we adopted last year when we had a Committee on the Food Products of the North-West was to send a list of questions a day or two before to gentlemen who were to come before us to give information. We would have done that with you, but we have not got them in print, so that if you wish you may make a general statement to-day, and then we will give you a list of these questions to read over and will ask you to appear before us again on Monday.

Mr. ANDERSON—Before making any statement I wish to say that my father was appointed by the Home Government in 1855 to go in search of Sir John Franklin, in charge of a party with a Mr. Stuart, a chief trader of the Hudson Bay Company, as an assistant of his. I have with me the diary he kept of that trip, and I find very valuable information all through it with regard to the different growths and the different plants of that region, which he observed on the trip. I find that he went up the Mackenzie River from Fort Simpson until he struck Great Slave Lake, and from there went to Fort Resolution, and from Fort Resolution he went down the Fish River, known as Back River, to the sea coast and this (holding the memorandum book in his hand) is the diary of that whole trip. He had two canoes and 12 or 15 men, and I find in different parts of his diary that he mentions that on 5th June, 1855, at Great Slave Lake, gooseberries were in blossom. I find that on 7th June he mentions that strawberries were in flower on Big Island.

Honorable Mr. TURNER—Would it not be better to appoint a committee to go through this book and put in such portions of it as are considered valuable, and merely take the evidence of Mr. Anderson as to what he saw himself and put in the diary as an addenda to his evidence?

The CHAIRMAN—Mr. Anderson has kindly intimated that he is willing to put this diary at the disposal of the Committee, with the exception of such private memoranda as have no bearing on the objects of this investigation.

Mr. ANDERSON—This diary has never been published yet, and I do not know that I have any right to have the book published. I am willing to hand these books to Dr. Dawson to read them over and allow him to hand in to the Committee what he thinks valuable as information. I would not like to have the whole of my father's private papers published.

By Honorable Mr. Girard :

Q. You say you left Fort Simpson when you were 11 years old? **A.** Yes.

Q. And you remember the impressions that you had of the country at that time? **A.** Yes; distinctly. I remember as far as what I saw grown there—I remember potatoes, turnips and barley growing there. Annually there was a York boat loaded with potatoes and sent to Fort Good Hope—that is 400 miles further north, so that they could not have grown potatoes there. I remember very well Fort Simpson supplying potatoes for that post. Mr. Adam McBeth, who is married to one of my aunts and is now living at Fort Qu'Appelle, was at that time the trader in charge of Fort Good Hope.

Q. What size were the potatoes that you saw grown there? **A.** The ordinary size—not any different from what they are in other parts of Canada.

By Honorable Mr. Turner :

Q. Were the potatoes there as large as they are down at Edmonton? **A.** I do not know. They are as large as they are in Ontario at any rate.

By Honorable Mr. Girard :

Q. Was the quality as good? **A.** Yes, just as good. Round Fort Simpson, itself, I remember the timber there was very large. It was fir, poplar and birch.

By Honorable Mr. Alexander :

Q. What is the latitude of Fort Simpson? **A.** About 62°. The fir there was very large. I fancy it was a hemlock—hemlock, poplar and birch were the varieties of timber that I remember growing there.

By Honorable Mr. Turner :

Q. I suppose it was the Norway spruce? **A.** I do not remember particularly. I know it was a very large kind. I remember that the men in the winter used to square the timber for building purposes. They used to build their houses of the timber squared; the fort itself was built of squared timber, and the trees were very large.

Q. What was the diameter? **A.** I think the timber was squared to about 1 foot square.

By Honorable Mr. McInnes :

Q. They would not select the largest trees for those buildings at any rate? **A.** No, I should think not. On the west side of the river there seemed to be very good

land all round there, but on the east side opposite Fort Simpson, there was a large muskeg. The river was over a half mile in width at that place with a very rapid current and at low water mark, I should say from what I remember of it that the stream was about 30 feet below the tops of the banks and when the ice was going out in the spring it was shoved up on top of the banks.

Q. What season of the year did the ice generally move out of the river. A. About the middle of May. All my father's diaries relate that when he started to examine the different trading posts in the spring that he generally left about the beginning of May.

By Honorable Mr. Girard :

Q. Is there any cedar in that district? A. No, I think there is no cedar there. There are just the three timbers that I remember. The way I remember the birch was, it was used so much in the making of snow shoes and other things.

By Honorable Mr. Alexander :

Q. There are large numbers of cariboo and moose there? A. Yes, and abundance of rabbits.

Q. The severity of the climate there would not be worse than at St. Petersburg? A. No, I do not think it would, but it is very cold there. The ice in the river there, I think, is about fully six feet thick. It freezes that depth.

By Honorable Mr. Turner :

Q. What is the depth of the river at Fort Simpson? A. It is very deep; it is an immense river there.

By Honorable Mr. McInnes :

Q. Is it a half mile wide there? A. It is more than that.

Q. Is it navigable for steamers? A. Yes, any steamer could go there.

Q. What is the channel average of the river for 15 miles up and down from Fort Simpson? A. I have not been down the river there. I have been up the river and it seems to hold its width for quite a piece up.

By Honorable Mr. Gowan :

Q. You say on the 7th June you were at this particular place on the river; was there ice on the river then? A. No. There is a floe of ice, a small floe of ice sometimes.

Q. Does your personal recollection enable you to say whether there was ice in the river then or not? A. No, I could not recollect that.

Honorable Mr. ALEXANDER :—At Archangel, a long distance north of St. Petersburg, there are large settlements and the Church of Rome has very large establishments there.

By Honorable Mr. Girard :

Q. What is Fort Simpson? A. It is the headquarters of the Hudson's Bay Company for that district.

Q. Are there many houses there? A. No, only the fort itself.

By Honorable Mr. Turner :

Q. There is no village there? A. No.

By Honorable Mr. Girard :

Q. Do you remember the fruit trees of the country? A. Yes. I have often eaten the gooseberry and the strawberry there.

Q. Had you the plum tree there? A. I do not think the plum grows there.

By Honorable Mr. Alexander :

Q. Have any seams of coal been found at the surface? A. All I know about coal is this: in my father's diary he mentions sending samples of Mackenzie River coal. That was in 1852.

By the Chairman :

Q. Does he say from what part he sent it? A. No, he says "Mackenzie River coal," and he speaks of plumbago from the Yukon.

By Honorable Mr. Girard :

Q. You spoke of a large muskeg at Fort Simpson? A. It is right opposite Fort Simpson.

Q. Nothing is grown there? A. No.

Q. You never heard of wild rice in that part of the country? A. No, there is none that I ever heard of.

By Honorable Mr. Gowan :

Q. How long did you remain in that part of the country? A. I was there for nearly five years.

Q. How far north have you been? A. I was never past Fort Simpson.

Q. But you were five years continuously there? A. Yes.

By Honorable Mr. Girard :

Q. What was the Fort Simpson district at that time as a fur country? A. It was the best district that the Hudson's Bay Company had at that time.

Q. What kind of fur was procured there? A. Every fur you can think of—the silver fox, beaver, marten, lynx and foxes of all kinds.

By the Chairman :

Q. Had you the fisher? A. Yes.

Q. The otter? A. Yes.

Q. The mink? A. Yes.

Q. The Hudson's Bay sable? A. I do not remember that.

Q. The rabbit? A. Yes.

Q. The bear? Yes.

By Honorable Mr. Turner :

Q. Had you all kinds of bear—the grizzly? A. No, I never heard of the grizzly there. We used to get the black bear.

By Honorable Mr. McLanes :

Q. Had you the brown bear? A. No, I do not remember that.

Q. Do you remember the elk? A. No, I remember the moose. The moose is the principal animal that the Indians kill.

Q. Does the musk ox get as far south as that? A. No, the musk ox is found on the Arctic coast.

By Honorable Mr. Turner :

Q. The fur in that country must be very good, being so far north? A. Yes, it is very good.

Q. Have you the muskrat? A. Yes, but I do not think they bothered much with them at that time. They were of very little value.

Q. It would have cost too much to move them? A. Yes.

By Honorable Mr. McInnes :

Q. Had you the house rats there? A. No, there were no house rats.

By Honorable Mr. Turner :

Q. Have you the gopher? A. No, but there is the squirrel. I was a very small boy at the time and I remember the mice. They were very pretty and peculiar, with red noses.

By the Chairman :

Q. Had the Hudson Bay Company any domestic animals there? A. Yes, they had cows and oxen.

Q. Had they any horses? A. No, they had none there.

By Honorable Mr. Turner :

Q. They, of course, cannot live out in winter in that climate? A. No.

By the Chairman :

Q. Had they any sheep? A. No.

Q. In your opinion, would the country be fit for sheep? A. Of course, if they were kept the same way as the cattle were kept, it would be.

By Honorable Mr. McInnes :

Q. You say that the country round there is a wooded country? A. Yes, but the farm was cleared.

Q. When cleared, did it produce good grass? A. Yes, very good grass; cattle pasture all summer there.

Q. What kind of grass is grown there—clover or timothy? A. No, there is nothing of that kind grown there; it is just the native grass.

Q. It sprang up after the land was cleared? A. Yes. In the summer time, near Fort Simpson, they used to cut their hay for the cattle for winter along the rivers.

By Honorable Mr. Turner :

Q. The gooseberries and strawberries you speak of were wild? A. Yes.

Q. You had none of the garden varieties? A. No, they were wild, and wild cranberries grow there also.

Q. Is the saskatoon found there? A. Yes, that is the high cranberry. We picked them mostly in the winter.

By the Chairman :

Q. I notice that you have some specimens in this book; where are they from? A. Here is one specimen from about Slave Lake—Big Island, Slave Lake.

Q. Do you know anything about it? A. No; I just found it in the book. Professor MACOUN. That is a swamp plant. Its English name is *Golden Saxifrage*. It is not indicative of climate, because it grows in cool swamps.

The WITNESS.—There is another specimen here from the Arctic coast.

Professor MACOUN.—That is the Arctic willow—*Salix Arctica*.

By Honorable Mr. Turner :

Q. Does the wild pea grow in that country? A. I do not remember.

By Honorable Mr. Chaffers :

Q. What month does the snow fall generally, to remain all winter? A. I could not remember that. I could find that out for you by the diary.

Q. How deep is the snow? A. Pretty deep.

Q. How many feet? A. I could not remember that.

By Honorable Mr. McInnes :

Q. I suppose the frost penetrates down as far as there is any soil? A. It seems to me, from what I remember of it, that the vegetation in spring there is about as early as it is in Ontario.

By the Chairman :

Q. Do you recollect what time your father put in his garden vegetables? A. I do not remember. My mother is still living, and I could ask her. She would remember that.

By Honorable Mr. Girard :

Q. Had you the products of the garden early in the summer time? A. Yes.

Q. As early as August? A. Yes.

HON. MR. HOWLAN. The witness says that the strawberry is in blossom there about the 7th June; that is about the time it blossoms in Prince Edward Island.

By Honorable Mr. Turner :

Q. What is the depth of snow generally on the level? A. It is very deep; there must be two or three feet of snow on the level.

Q. And it lies all winter? A. Yes, all winter. In the winter we had only two or three hours of daylight at Fort Simpson, and in summer you could hardly tell any difference between the day and the night.

Q. It is always clear day in midsummer? A. Nearly always.

By the Chairman :

Q. Have you any knowledge of practical farming? A. Yes.

Q. What effect would that increase of daylight have on the growth of plants? A. It must have a wonderful effect; there is no doubt of that. It must benefit vegetation greatly.

Q. Does it prevent the ground from cooling off at night? A. I do not think so. Of course towards the evenings it is a little cooler than in the day time.

Q. You gave a list of the fur bearing animals, we would like to have a list of the animals used for food? A. I have already mentioned the moose and the rabbit.

Q. Are you referring now to Fort Simpson and north of it? A. To Fort Simpson; that is all I can give any information about.

By Honorable Mr. Turner :

Q. Have you the hare? A. No, just the common rabbit.

Q. The caribou? A. I do not remember the caribou or deer. There is the partridge.

Q. The white or grey? A. The grey partridge. There was a white partridge there in the winter too.

Q. Does the color change? A. No, it does not change.

Q. Have you the common pigeon? A. No.

Q. Geese and ducks? A. Yes, any quantity and of every kind. In the spring and fall they pass over Fort Simpson so thickly that there is no difficulty killing any quantity. They generally pass through there when the ice is breaking up and flowing down the river—any quantity of them.

Q. That would be about April? A. No, it would be later than that—in May I should say.

Q. And they go back again in September? A. Yes, in the fall.

By the Chairman:

Q. Have you up there any wading birds, such as the loon? A. They have the loon; I have seen the loon there.

Q. What other waders? A. I do not know of any others. Of course I was very young at the time, and it is only certain things I remember.

Q. Will you look at this map; it has been roughly assumed that the country north of Manitoba is not only unknown, but believed to be barren. In fact, it is called the *barren grounds*. Can you tell us whether the line of delimitation shown on the map is correct? A. I do not think it is correct. I know along the Churchill River they raised stuff all through there. The Indians raise stuff there.

Q. Point out some localities that you know? A. Take Norway House as a point.

By Honorable Mr. Turner:

Q. How far is Fort Simpson from the Hudson's Bay? A. About seven or eight hundred miles.

Q. Straight west? A. Yes. I would not like to say much about the localities but I have been told that produce is raised all through the Churchill country.

By the Chairman:

Q. Is it your impression that the barren grounds are entirely useless, or is it possible that they are of any economic value? A. You come too far south on this map for the barren ground. I see in my father's map he gives the barren grounds right on the Arctic coast. They are away up north, right on the coast, almost. I think myself that a great part of this country north of Manitoba is good—I think possibly a good deal of the part called barren grounds between latitude 52 and 56, or perhaps further north.

Q. You think perhaps in the future they might afford pasturage for cattle? A. I could not say. All I know is this: I met people last summer and spoke of the subject. I was talking to a gentleman who had been up in that country exploring, and he tells me that large numbers of caribou winter up there and they live on the grass. If it was all barren lands how could they live there?

By Honorable Mr. McInnes:

Q. Does not the caribou browse a good deal? A. They generally live around little swamps, where grass grows.

Q. But in the winter? A. In the winter of course they have to browse?

By the Chairman:

Q. Would you give us a list of the fish in the river itself? A. The only fish that I can remember is a fish that they call La Loche.

Professor Macoun—They call it Ling at Portage La Loche. It has no scale and is like an eel.

By Honorable Mr. Turner:

Q. Is the flesh good at all? A. No, the flesh is not considered very good. They give it to the dogs and eat the liver.

Q. What size do they attain? A. They are very large.

Q. Do they reach 30 or 40 lbs.? A. No, they will weigh, I suppose, about 10 lbs.

Q. What other fish are there? A. Whitefish and trout.

Q. Do all these come out of the river? A. The Mackenzie at Fort Simpson was not considered a good fishing ground, because I remember well all those fish that they used to supply the Hudson's Bay Company's post with were got at Big Island, near the mouth of Big Slave Lake.

Q. Are there good fish in Slave Lake? A. There are splendid fish there of all kinds.

Q. When you say all kinds, will you mention the different varieties? A. The fish they generally got there were whitefish and trout. Of course those were the only kinds they cared much about?

Q. Were they trout salmon or brook trout? A. I could not tell you that?

Q. Were they large fish? A. Yes, and nice size. They were about the size of those caught in Lake Winnipeg.

By Honorable Mr. Girard :

Q. Would they be 12 lbs. weight? A. Yes, about that. They were caught and brought to Fort Simpson and hung up, and the dogs and men and everybody used them through the winter?

By the Chairman :

Q. What force of people at that fort and in the district were those fish caught for? A. I could not tell you that. The force at Fort Simpson itself must have been about 50 or 60 people.

By Honorable Mr. McInnes :

Q. All white people? A. No, principally half-breeds and a few Orkney men.

By Honorable Mr. Turner :

Q. Did the Arctic trout come up as far as Fort Simpson? A. I do not remember.

By the Chairman :

Q. Did your father descend the Mackenzie River to its mouth. A. Several times. I remember hearing him tell about the whale spouting at the mouth of the river.

Q. Do you remember hearing him say anything about seals? A. No.

Q. What do you infer, from the general conversations of your father, was the character of the navigation? Do you suppose that a sea-going steamer could ascend that river? There is no doubt about it.

Q. How far? A. I do not know how far, but it could ascend to Fort Simpson and a good deal this side of it—I could not say how far this side of it.

Q. Can you give the Committee an idea of how long the river is open during the summer at Fort Simpson? A. I should say there would be about five months, at any rate, that it would be open.

By Honorable Mr. Turner :

Q. That would be from the end of May until September? A. Not quite five months, but close to it.

By Honorable Mr. McInnes :

Q. Right from Fort Simpson to the mouth? A. Yes. I know boats started down about the middle of June, so the river must have been open all the way down.

By Honorable Mr. Turner :

Q. Is the water in the Mackenzie River very cold in summer? A. I do not think so.

Q. Could you for instance go in and bathe in the river? A. Yes, I have known them to bathe in it very often. I have often bathed in it myself with my father. I find in my father's diary that he arrived at the Arctic coast in July and found the sea open.

By Honorable Mr. McInnes :

Q. Where was his starting point? A. He started from Fort Simpson and descended the river until he came to Great Slave Lake and continued north until he struck the Great Fish River, or Back River.

Q. He went down the Great Fish River? A. Yes.

Q. What time did he find that river open? A. He went through that in June.

Q. At what time did he reach the sea-coast? A. I do not remember: he gives it in the diary. He went through Lake Garry and then through a river which has an Indian name. I do not remember the name, but it connects Lake Garry and Lake Franklin. Then through another small river into the sea.

Q. What did he find in the way of minerals, animals and vegetables? A. He speaks of the musk ox, geese, duck, and he continually speaks of fish of all kinds that he caught in the river there.

Q. Does he speak of fish at the mouth? A. I have not read the diary very carefully and I cannot say.

By the Chairman:

Q. In replying to the questions that we will give you to-morrow to answer on Monday, we should like you to furnish all the information you can give about the run of salmon, whether the salmon runs up any of the Arctic streams. It is well-known that the geography of that country is put there a good deal by guess and that the Great Slave Lake is a great deal larger than is represented on that map? A. Yes, there is no doubt of that.

Q. You say that it is second only to Lake Superior in size? A. It is an immense lake.

By Honorable Mr. Turner:

Q. Is it a deep lake? A. Yes.

Q. Cold water? A. Yes, it is a beautiful fishing lake also.

By the Chairman:

Q. You say also that the configuration of Great Bear Lake is incorrectly described, because you have in your father's books the exact outline. The maps do not show its real position nor do they show the outline of it? A. They do not.

Q. Has this letter ever been published—the letter from your father to Lady Franklin which is now before the Committee? A. No, it never has been published, and there is a long letter from Sir George Simpson ahead of that, and I do not know that it has ever been published either.

Q. Can you give us any information about the summer temperature about the Mackenzie River region? A. I find from my father's diary that on the 28th May, poplar and birch trees were bursting into leaf at Fort Simpson, latitude 62 degrees; and that prior to that time the hottest day had been 62 degrees.

The Committee adjourned until Monday.

THE SENATE,

COMMITTEE ROOM No. 17,

OTTAWA, Monday, 9th April, 1888.

The Committee met at 11 a.m.

MALCOLM McLEOD, Q.C., of Aylmer, County of Ottawa, P. Q., being introduced by the Chairman said:—

I was born in the North-West at Green Lake a sub-Arctic region called English River District. I was young when I left the country, still I have sufficient personal recollection of it from the foot of the Rocky Mountains to Hudson's Bay to be able to give some evidence as to its physical features, its agricultural capabilities, its food resources and general character. Beyond that—the Mackenzie Region proper, and I may say that Green Lake is on the verge of the Mackenzie River Basin—I have only documentary evidence furnished by a synoptical report of official letters to my father when in charge of Norway House between 1826 and 1830. Norway House was the centre until a few years ago of the Hudson's Bay territories for the working of the company's system. Their brigades used to meet there every year from all quarters—from the Arctic to the Pacific and from the Pacific to the Hudson's Bay, the council was held there and the affairs of the territories were all administered from there. My father was in charge, and these letters came to him officially, and also from every post annually, privately. In all of those letters the food question was a vital one, and

every letter touched on the subject. At many of the posts it was a very vital question, but I notice in all of them the food resources of the country are discussed—say the food capability of the place, the staple supplies, whether deer, hares, fish, &c. These letters I have with me. The documents were not written with any object to deceive. They were all parties entirely within the company, and in the full confidence of the company; I therefore submit them as really a truthful representation of the food resources of the whole country which they cover. Amongst the contributors to that information, I find all the Arctic explorers from Franklin to the days of Sir George Simpson—all the chief officers of the chief posts, and very interesting too, of the original explorers of the country between the Mackenzie River and Yukon. That country was first explored by a namesake of my father, John McLeod, jun. There are some of his letters there that give an account of the country. Amongst them also I find other names with reference to the explorations of that region, particularly those of John Stuart after whom Stuart's Lake in the northern part of British Columbia was named. There are several letters of his on that subject, because he was stationed at Fort Simpson a considerable time and was familiar with all that northern region. Mr. Stuart speaks of Fort Simpson, the region about there, the extent of it and this then new country between the Mackenzie River and the Yukon. He, I may state, was one of the party who ran the Mackenzie River with Simon Fraser originally. That wonderful feat was accomplished by Simon Fraser, Mackenzie, Stuart, Faris and Quesnelle. I knew all the parties intimately except Fraser; and as for Stuart, like all others there, his word is to be taken certainly as perfect evidence on the subjects with which he deals. That is the nature of the evidence I have to give. I may state also, incidentally, that seventeen years ago I wrote a book called "Peace River," on the documentary evidence in hand, and specially based on the journal of a canoe voyage by Sir George Simpson from the shores of Hudson's Bay to the Pacific. He kept a journal of the trip in very full details, and it is exceedingly valuable. In giving information of the North-West to Mr. Sandford Fleming, at the time he was gathering data for the Pacific Railway project, I happened to lay these journals, amongst other papers, before him with hand maps, and especially the map of the Gorge of the Fraser; and he read it over to me and suggested that it would be very valuable at this time that it should be published. I did publish it in April, 1872, and distributed it in Canada, England and elsewhere. It was at that time I undertook to map out the agricultural areas of our North-West. It was the first time that that was done, and I happened to be in a position to do it. That map has been adopted since, I see, in official books, and in all the books that treat upon the North-West country, it is the basis of that subject. I was examined before the Immigration and Colonization Committee of the House of Commons in 1876 on the North-West question, and I gave again the distinctive areas there. Before that I had published them in the *Lovell's Gazetteer of British North America*, viz., mapping out the wheat areas and the areas not adapted to wheat growing, but known to be fit for barley and potatoes, and those for pastoral purposes. As to the particular subject of wheat, how I was enabled to say what was a wheat area and what was not was in this way: Those who have lived in the North-West are familiar with the berries that grow there. The service berry, for instance, is the staple berry for food, and it is largely used in the manufacture of pemmican. My maternal grandfather, (Chief Factor John Peter Pruden) was in charge of Fort Carleton for some years—in fact he built Fort Carleton, and the principal business of Fort Carleton was to collect pemmican and food supplies from the Indians for the brigade service of the territories. He, there, to supplement his food supplies obtained from the Indians, went into gardening; and a splendid kitchen garden he had, I see from his reports. He raised everything we do in Canada, except Indian corn, without difficulty, and even Indian corn with special care; and this fact became familiar to us, that wherever the service berry would grow, wheat would grow. An uncle of mine, Chief Factor Herrot, had taken samples of wheat up to the foot of the Rocky Mountains, and took the first wheat to Fort Assiniboine, a very bleak region on the spur of the mountains. He was afraid at the time that it would not succeed there, but it

did succeed and has succeeded ever since. In that way we came to know certain facts regarding the vegetation and the agricultural resources of the country, and this important fact, that wherever these service berries ("Sassocootum"), or shad berries (I think they call them shad berries in the United States) grow, wheat can be grown, and I think I may appeal to Prof. Macoun if he has not found it pretty nearly so.

Prof. MACOUN.—Yes, it is actually so.

WITNESS.—We knew that the Peace region abounded with the service berry. No one had tried wheat, there, at that time however—not when I was in the country; but knowing the fact—because the flora of the country was to a certain extent known through the reports of Sir John Richardson—I concluded that wheat would grow there. He had written sufficient to indicate that there might be that degree of fertility in that region, but the fact was never put forth by the Hudson Bay Company in any way to attract public attention. It has since been confirmed and proved, that all that region is, I might say, almost half torrid. It is the region of the cactus—I am speaking now of the Peace River proper. These reports show that this fertility extends throughout the whole valley on the west side of Mackenzie River. It is proved by the experiments made at the different posts, but of course this fertility diminishes according as you approach the Arctic circle until nothing can be raised within it but turnips and potatoes. I have a very interesting letter from Mr. Thomas Simpson, the Arctic explorer, to my father dated from Fort Confidence. Fort Confidence is the most northerly habitation on this continent that is inhabited by white men. It is within the Arctic circle, 67 degrees 53 minutes and 36 seconds.

By Honorable Mr. Macdonald.

Q. Was that named by Sir John Franklin? A. No, Fort Confidence is beyond Franklin's outpost. Of course Franklin's expedition went further north. Simpson (with Dease) went over Franklin's ground and beyond it. There was a hiatus on the east and on the west, and this expedition of Dease and Simpson filled that up.

Q. And Simpson gave it a name? A. He not only gave it the name, but he erected the fort. This was in 1837. Fort Franklin is the most northerly post in Franklin's expedition. Simpson speaks of the food resources of Fort Confidence as being abundant. The distances between posts were so great that even Dease and Simpson's, which was a Hudson Bay expedition thoroughly equipped, could only carry food barely sufficient for use on the way, and they were there three winters—the winters of 36–37, 37–38, and 38–39—nearly three years, and they never failed a single day to have an abundant supply of food. Franklin suffered more, because they were not so well equipped at times; but it is a striking fact that notwithstanding the severity of the climate—especially in 1838 when the letter was written—an exceptionally severe season—the Great Bear Lake, where the fort was, at the north east end of it, was closed ten months out of the twelve. It was an exceptionally severe season, but in spite of that, with the large force of men they had there, there was no scarcity of food. They had abundance of fish, deer, musk ox and meat of other kinds at all times.

By the Chairman:

Q. Was this at Fort Confidence? A. Yes.

Q. What natural fruit or vegetable foods had they there? A. I remember that blueberries were abundant.

By Honorable Mr. Girard:

Q. How long were you in that country? A. I was born there.

Q. How old were you when you left there? A. I was only in my tenth year.

By Honorable Mr. Turner:

Q. Where were you born? A. At Green Lake, between North Saskatchewan and the Mackenzie River region.

By the Chairman:

Q. It is within the compass of our enquiry? A. Yes.

The following communication was read:—

DEPARTMENT OF FISHERIES, CANADA,
OTTAWA, 7th April, 1888.

SIR,—I have the honor to acknowledge the receipt of your letter of the 31st ultimo, and beg, in reply, to state that I shall have much pleasure in placing before the Senate Committee, any reports or other information which may be in the possession of this Department, relating to the fisheries of the Great Mackenzie Basin.

I have the honor to be, Sir,
Your obedient servant,

JOHN TILTON,
Deputy Minister of Fisheries.

Honorable JOHN SCHULTZ,
Chairman, Senate Committee.

A communication was read from W. J. McLean, the officer in charge of Lower Fort Garry in Manitoba, conveying with other information, the following :—

He passed ten years in charge of important posts in the Mackenzie River Basin, ten years of which he was in charge of Fort Liard and travelled nearly every summer up and down from Portage La Loche, the height of land or water-shed of the waters running south and those running north. Whilst at Fort Liard he says: "I had the good fortune of having had two wood buffaloes brought to me by the Indians, one was killed to the east, and the other to the west of the fort. A fact which I could not find on record in the journals of any of my predecessors. I also saw a good deal of meat of the wood buffalo on the Athabasca and Clear Water Rivers, dried exactly as the plain hunters used to dry the buffalo meat on the southern prairies." He offers to answer any questions and a number of these have been to-day sent to him.

JAMES ANDERSON, re-called and examined.

By the Chairman :

Q. Have you made an extract from the diary kept by your father of his journey from Fort Simpson to the Arctic in 1855? A. Yes, I will read some notes extracted from his journal taken in 1855 when in search of Sir John Franklin. He left Fort Simpson on the 28th May. The river was open, but ice drifting in the Upper Mackenzie. May 30th, birches and poplars begin to put out their leaves.

June 4th.—Vegetation has made rapid advances the last few days.

June 6th.—Gooseberries in flower; weather very warm.

June 7th.—Strawberries in flower; grasshoppers seen.

June 13th.—Cowslips in flower (*caltha palustris*) same date, near Fort Resolution. (that is somewhere in the neighborhood of latitude 61° or 62°); grass 18 inches high, and birches leafing.

By Honorable Mr. Power :

Q. Where is Fort Resolution? A. Near the mouth of the Slave River, on the Great Slave Lake.

June 19th.—Camped near the sulphur springs, west of Fort Resolution. As he proceeded up the lake he found the ice more solid.

June 28th.—Trap rocks looking exceedingly like those on Nipigon Bay. Many plants are now in flower, but they are all to be found in Mackenzie River valley (latitude 62° or 63°).

July 2nd.—Left the lake at this date and still found the ice very solid in places. He again speaks of the islands looking like those in Nipigon Bay.

July 5th.—Traces of marmots seen. Disintegrations of rock explained. Came on barren ground.

July 6th.—A marmot seen; ice still seen; disappearance of trees. Lake fishes, with fine salmon trout. Trees only 2 feet high.

July 8th.—Sandstone on Lake Aylmer fit for the finest grindstone.

July 11th.—Country around Lake Aylmer almost destitute of animal life.

July 15th.—Saw caribou and musk ox. Shot one (that would be about latitude 63°).

July 16th.—Grey waxes seen in numbers, moulting. Mention is made in the diary that large numbers were killed with sticks, as the birds were unable to fly.

July 17th.—Noticed that the weather was much warmer after leaving Lake Beachy (latitude 68 or 69). Capt. Back accounts for it by being further from the sea. Great number of Canada geese moulting. Canada geese were very common everywhere.

August 20th.—Canada geese and deer moving southward.

August 22nd.—Berries ripe—crow berries.

PROF. MACGOWN—Crow berries are the food of the wild geese. They are not valuable as food for human beings.

The WITNESS—(Continuing)—10th September.—Wood increased as they approached Slave Lake. Birch the size of axe handles. A whiskey jack seen.

I will now read extracts from a diary of 1850, as follows:—

September 19th.—Isle à la Croix to Athabasca. Sulphur Springs, game abundant. (It would be latitude 59, longitude 110 west.) Pines mentioned. Near Athabasca Forks *Bois Blanc* is found here. That is a kind of white wood. White cranes, geese and ducks in great numbers. The Athabasca is a noble river, low water, lots of sand banks.

September 20th.—Lime, iron and sandstone. Sand dried black by bitumen or naphtha which oozes out continually. Naphtha springs. Poplars and *epinettes* (The black spruce on this river are very large.)

September 22nd.—Timber of great size. Waxes (that is the white goose) here in thousands. Fort Simpson (about latitude 65) to Fort Good Hope, Mackenzie River.

May 21st, 1852.—Left Fort Good Hope and arrived at New Fort Norman (about latitude 65) on May 24th, mouth of Bear River.

By Honorable Mr. Power:

Q. Where is Fort Good Hope? A. It is near the sea. (Continuing) Poplar and birch in bud. (That is at Latitude 65.) At Fort Simpson, May 21st, they are in full leaf. Mackenzie River broke open at Fort Norman on May 9th. At Fort Good Hope, May 9th (latitude 67). Ice from above the ramparts came down on the 21st. Returned to Fort Simpson. May 22nd, near Fort Norman, fish plentiful. Between Fort Good Hope and Fort Norman (about 66 latitude) the rapids above the fort are very easy so that the boats go up without unloading. That is a little above Fort Simpson on the Mackenzie. I believe that a steamer could ascend those rapids.

June 22nd, 1852.—Mineral coal at the *Boucan* on the right of the river, between Fort Good Hope and Fort Norman, which is burning. There is more on the left, half way between Old and New Fort Norman.

June 6th.—Saw dragon flies.

June 7th.—Roses in bloom at Naphannie River (latitude 63) rapids at Fort Simpson a short distance above the Fort; lots of fish about the rapids.

July 11th, 1852.—Camped at the Tar Springs, Athabasca River.

July 14th.—Camped about six hours below Sulphur Springs.

July 16th.—Much disturbed with heat (latitude 58.)

July 14th, 1853.—Athabasca to Portage la Loche. Camped at White Earth Portage. There is a sort of white earth there which I suppose could be used as a sort of paint.

By Honorable Mr. Macdonald:

Q. There are salt springs there, are there not? A. Yes, I have seen those myself—the salt springs and the sulphur.

By the Chairman:

Q. Can you tell the Committee in your recollection what percentage of salt there was? A. I cannot say that, but it was very salty.

Q. Do the Hudson Bay Company manufacture salt there? A. No, the company gather the salt itself from the edges of the springs.

May 27th, 1858.—Calm and warm. Between Fort Simpson and Fort Good Hope, mosquitoes. Arrived at Fort Good Hope, May 30th. Met Esquimaux from Ander-

son River. Salt on Great Slave Lake, 20 kegs. Salt, 12 bags near the portage Great Slave River.

May 22nd, 1856.—A bad year for furs at Fort Liard (latitude 59); total absence of snow.

Fort Simpson, May 30th, 1856.—Saw the first flower. (Letter to Bishop Anderson, Red River Settlement.)

July, 1856.—Good barley and extra potatoes in large quantities. Climate very mild.

Letter, July 23rd, 1852.—Plumbago from Yukon and Mackenzie River, coal sent to Governor Colvil, Upper Fort Garry. This letter is so important that I would ask you to have some one read it to the Committee.

The following letter was then read:—

"The substance of Mr. McFarlane's report gathered from the Indians, is as follows: Big Hula Dessi, or Inconnu River, takes its rise to the westward of Bear Lake, from beneath the horn-shaped mountain cone, northwesterly to the fort, whence one branch flows into the Liverpool Bay, and the other a little to the eastward of Esquimaux Bay. Several rivers fall into it as per sketch. Current in the upper parts strong; in the lower part more like the Mackenzie. Four rapids and falls. At the Forks it is as broad as the Mackenzie at Simpson."

By the Chairman.

What river does he refer to? A. A river near Bear Lake which is not marked on any of the maps.

I understand this to be a contribution to the geography of the region which does not appear on any of our maps? Yes. (Continuing):—"At the forks it is as broad as the Mackenzie River at Fort Simpson, does not dry up in summer, very deep. Mr. McBeth states the water very clear; navigable by a boat from source to the mouth. Banks higher than those of the Mackenzie. Well wooded for some distance in from the river. Pine large. Birch and pine of good size at the forks. No wood within a day's march of the coast. On the banks of the river marten, otter, foxes, bears, wolves and wolverines abound; also moose, reindeer, musk oxen—the latter all over the country. Inconnu fish, white and blue fish, carp, trout and pike abound in the river and adjacent lakes. Rivers said to break up earlier than the Mackenzie."

Q. What is the latitude of the river? A. Of course it runs into the ocean the same as the Mackenzie River. I should say it would enter the sea at about longitude 120.

Q. What is the latitude of its source? A. About 64 or 65. (Continuing):—"The river is said to break up earlier than the Mackenzie. Tar and sulphur springs abound in various parts of the country, particularly at Lac la Port and Beauvais. Veins of fine white earth found along the river and near the forks. No wood on the borders of Esquimaux Lake. Plenty of drift wood on the coast. Esquimaux peaceable. Passed a summer at the Esquimaux Lake. Source of the Inconnu River is seven days' march, about, from Fort Good Hope; to the mouth, about thirteen days."

Q. What is the length of a day's march? A. About 25 or 30 miles. (Continuing):—"Lac la Port, about two spring days from Fort Good Hope. Smoking mountains seen near the coast to the eastward of Big Hula."

Q. Did your father, in conversation, mention whether these were volcanoes, or what those smoking mountains were? A. No, I never heard him say anything of it.

Q. Have you obtained any information on the subject from reading his notes? A. I have not read them carefully. There is a letter to Sir George Simpson, that describes the country well. It is between the Copper Mine and the Anderson River. The extract from the diary continued:—

May 22nd.—Mentions on his way to Fort Liard on Liard River, that on one part of the river it cuts its way through a mountainous sandstone. The banks are absolutely perpendicular.

September 12th, 1850.—Ile à la Crosse, they raise wheat, potatoes, &c. Navigation from the mouth of the Mackenzie River to Fort Resolution on the Great Slave Lake should be good. That is a distance of about 1,150 miles—from the mouth of

Mackenzie River to Fort Simpson is 800 miles, and from Fort Simpson to Fort Resolution 350 miles. There are rapids near Fort Good Hope (latitude 67) but they cannot be very bad, as the boats ascend with lines without unloading. There are also similar rapids above Fort Simpson.

Great Slave Lake to Athabasca Lake.—Athabasca River full of rapids. Sulphur, coal oil, and salt springs. The wood that I remember seeing in that country myself consists of birch, poplar, balsams, hemlock or pine, and the red willow. The minerals are: red earth, sulphur, coal oil, salt, white earth, limestone, ironstone, sandstone. I have seen all these myself.

By the Chairman :

Q. Would you mention the localities where these are found? A. All along the Mackenzie River and the Athabasca. The furs that I know of are: beaver, marten, silver fox, lynx, otter, cross fox, blue fox, red fox, musquash (muskrat) mink, bears (black and cinnamon) wolves and wolverines. The food animals amongst these are the beaver and bear. Towards the ocean you get the musk ox and the reindeer, and all the fur-bearing animals are found along the coast. The food animals on the Mackenzie River are the moose, rabbit, wood partridge, white partridge, geese of all kinds (spring and fall) cranes, waveys, ducks of all kinds. The fish are: whitefish, la loche, trout, suckers, brochet, salmon, near the coast. Whalebone is also spoken of, so that whale must be found on the coast also.

By Honorable Mr. Power :

Q. You say reindeer: is that the same animal as our moose? A. No, it is a small deer, similar to the deer from this part of the country. Other foods found in that part of the country are a lichen, which grows on rocks, wild tea and the inside bark of the poplar. Of medicines I remember them using the inside bark of the red willow. The outer bark is scraped off, the inner bark is taken and boiled, and the decoction is used as an emetic. They also dry and smoke it. Sarsaparilla is used there also.

Prof. Macoun.—The lichen spoken of there is called *unbilicaria*, but the common name is *tripe de la roche*.

The Witness.—The berries are strawberries, gooseberries, yellow raspberry and common raspberry, high cranberry, blue berry and bear berry.

By Honorable Mr. Girard :

Q. Have you not the saskatoon there? A. No, I do not remember that, but they may have it.

By Honorable Mr. Power :

Q. I think you spoke of wild tea: is that the same kind of Indian tea as grows on Labrador? A. Yes, the same.

By the Chairman :

Q. Have you ever tasted it? A. Yes.

Q. Is it what they call Labrador tea? A. Yes.

Q. Is it the same kind that the Hudson Bay Company once exported a lot of it to England? A. I cannot say.

By Honorable Mr. Girard :

Q. Is it used there as tea? A. Very little. They use it when they cannot get ordinary tea. I would rather take Epsom salts than drink it.

Mr. McLendon.—It is the reverse of cheering; it is a soporific.

The Committee adjourned until 11 a. m. to-morrow.

THE SENATE,

OTTAWA, Tuesday, 10th April, 1888.

The Committee met at 11 a.m.

The following letters were read :

" GEOLOGICAL AND NATURAL HISTORY SURVEY,

" OTTAWA, 9th April, 1888.

" MY DEAR DR. SCHULTZ,—I send you to-day a map of Canada on which I have had marked with a heavy blue line all the routes that have been travelled and examined by various members of the Geological Survey in the region north of the Saskatchewan and west of Hudson Bay. It brings out distinctly the very large areas yet to be explored and of which we at present know nothing definitely, not even the geography.

" I am yours faithfully,

" ALFRED R. C. SELWYN.

" The Honorable Senator SCHULTZ,
" Senate, Ottawa."

" CENTRAL EXPERIMENTAL FARM,

" OTTAWA, 7th April, 1888.

" DEAR DR. SCHULTZ,—Your esteemed letter of the 6th reached me to day. It will be quite impossible for me to prepare the specimens you desire and have them ready for your committee meeting on Monday. I hope, however, to have them with the samples you desire for distribution in the territory you are now investigating in time for your meeting on Tuesday morning at 11. The samples will be prepared already for shipment with tags attached so that they will only require addressing. I shall also be glad to give you any information in my power regarding the localities in Russia from whence these cereals have been obtained, and to aid you in every way I can in the important work in which you are engaged. We have already sent this season more than 400 sample bags of the Ladoga wheat to the North-West Territories extending from the United States boundary line to Dunvegan on the Peace River, in latitude 56, covering the country well, north of the railway belt through the Prince Albert, Battleford and Edmonton districts. I feel confident that much good will result to the whole Dominion from this line of work.

" Yours very sincerely,

" WM. SAUNDERS."

JAMES ANDERSON re-called and examined.

By the Chairman :

Q. Are you now ready to take up the questions and answer them, or will you read from your father's diary? A. A great deal of the information which I possess is from diaries kept from my late father. Very little of it is from personal knowledge, except what I remember about Fort Simpson. I have here notes relating to the west branch of the Liard River.

Q. Where is Fort Halkett? A. About latitude 60. Fort Halkett and Fort Liard mean the same thing. I have been trying to find out from these notes when the Mackenzie River opens, but I do not see it anywhere mentioned. I find that the river closed on October 5th.

Q. What did you find to be the earliest time that the navigation was open? A. In the diary I find that they started with their boats on May 22nd. It does not say when the river opened, but they started down the river on that day. One year it

was open on the 9th of May, as far north as latitude 57. In 1857 the Mackenzie was still open on October 5th. In a letter to Sir Geo. Simpson, dated September 14th, 1855, I find that a map was sent to him by my father, showing the route of the Arctic expedition, and showing that whole country. There may be a chance of getting hold of that map. The following are the notes regarding the navigation of the west branch of the Liard River :—

The usual period of high water in the west branch (Liard) is from 10th June to the 25th July (McPherson).

Water began to rise at Fort Simpson (the second time) from the summer flow of the Liard in 1848, 18th July; 1849, 10th July; 1850, 17th July.

The water subsides about the beginning of July, and begins to rise about the 10th.

In 1840 Campbell left Halkett, 1st July, in canoe; reached Francis Lake 19th; left on foot 23rd, and reached the Pelley on the 31st.

In 1842 Francis Lake established by Campbell. Left Simpson 27th June (when the water had subsided), arrived at Liard 2nd July (six days). Left 4th July, reached Devil's Portage 18th July (15 days); made a road across the portage about three miles, and launched boat and carried cargoes across, 23rd, evening (5 days); reached Halkett 25th (2 days). Left 27th; reached Francis Lake 13th August (18). Total voyage, including stoppages, 49 days. Water high.

In 1843 Christie left Simpson 29th June—water very high—and arrived at Liard 8th July.

In fall, 1844, Campbell took 41 days to go up to Francis Lake from Simpson; ten Indians deserted, which retarded him, but the water was very low.

In 1850 Stewart performed the trip from Simpson to Francis Lake in 46 days; high water the whole way up; left Simpson 13th June.

Road from Francis Lake to Pelley Banks.—A portage (bad) 20 miles to the head of the Cordellais Cascades, Finlayson's Branch, thence possible to navigate a canoe about 40 miles to Beaver Forks, thence 18 miles to Finlayson's Lake; river insignificant, much barred with trees, but it is possible to get a middle-sized canoe up light; thence across Finlayson's Lake 22 miles, a short portage to another small lake 3 miles long, whence the waters run westward, thence a small (Beaver) creek which passes through some small lakes out of the direct course, thence a portage 40 miles through thick woods, with the exception of 2 small lakes and a short piece of river falling into the Pelley, in all perhaps 7 miles, to the Pelley River.

In 1843, Campbell walked from Francis Lake (bad walking) to Pelley Banks in 5 days, left 30th May, arrived 4th June.

In 1843, Campbell mentions that one of his men went from Francis Lake to the cache on the Pelley and returned in 7 days, with 350 meat from the cache.

From Pelley Banks to the Forks Lewis and Pelley (Selkirk), Campbell with a crew of 3 whites and 3 Indians in canoe left Pelley Banks, early on the 5th June, 1843.—Water high, current strong; early on the 6th reached the cascades and made the Pre Portage (2,840 paces) say 2 miles; 7th and 8th saw Indians *gens de Couteau*; afternoon 11th, arrived at the Forks when he saw 55 men, women and children, *gens de bois*, returned thence and reached Francis Lake 15th July, as they had to hunt the way, their march was not forced.

Francis Lake was established by Campbell, 1842.

Campbell discovered the Pelley in 1840.

Bell discovered the Lower Yukon, 1845.

Went down Porcupine or Rat River in 3 days, in 1842.

Yukon established 1847.

Selkirk established 1848.

Mr. McPherson, under date July 26th, 1847, states that the trade at Forts Norman and Good Hope had suffered much on account of the Mountain Indians resorting to Francis Lake and Pelley Banks.

Calculation for a trip from Simpson *via* the West Branch and Yukon, and to return *via* Pelley River and Yukon, to leave 20th May:

	Days
Simpson to Liard.....	7
Liard to Halkett.....	12
Halkett to Francis Lake.....	10
Francis Lake to Pelley Banks.....	7
Pelley Banks to Forks (Selkirk).....	5
Selkirk to Yukon, allowing 3 days for exploration.....	8
Yukon to La P. Ho.....	12
La P. Ho to Peels River.....	4
Peels River to Simpson.....	17
	<hr/>
	82
Allow 3 days for detention.....	3
	<hr/>
	85
	<hr/>

Arrive at Simpson 12th August, which would be a close shave.

NOTE.—This calculation was made under the idea of being met by a canoe at Pelley Banks and of receiving a supply of provisions at Selkirk. Now we would have to hunt our way and carry the canoe across.

Q. Have you any further details from the journals of your father with regard to the opening and closing of the rivers? A. I find from the journal that the Mackenzie River was open October 5th, 1857, and the Liard River was still open October 5th, 1857. The record does not say when it closed; it merely says, "boats going up." We found from the notes I gave you yesterday, that the river is open on May 7th, and it may be of some benefit to the Committee to try and find this map referred to. I see that there is attention drawn in the letter sent to Sir George Simpson, September 14th, 1855, to a map of the whole Arctic expedition. That would be a very valuable map, because it gives a description of the whole country, and it will likely be in possession of the Hudson Bay Company in London now. I also find that from Fort Good Hope on the Mackenzie River is two days' journey to Great Bear Lake.

Q. There are three Fort Good Hopes marked upon the map. One is evidently a mistake in printing; it should be Fort Norman? A. Yes, Fort Norman is the first below Fort Simpson; the second one is Fort Good Hope. The distance from Fort Good Hope to Great Bear Lake is two days' journey counting twenty to thirty miles a day.

Q. What can you tell us about the size of Bear Lake? A. I cannot say anything about that; there is nothing in the notes to show. It merely says that the River Begnute flows from Bear Lake to the Arctic Ocean.

Q. Are the Committee to understand that Great Bear Lake has two outlets, and that one flows into the Mackenzie? A. No, the Great Bear Lake does not empty into the Mackenzie River at all. In a letter to Sir George Simpson, of March 25th, 1857, I find that the deer hunting and trapping were bad at Fort Liard and Fort Halkett because of their being no snow. I fancy there was no snow the whole winter there, from the notes before me; but that was an exceptional winter.

By Honorable Mr. Kawbach:

Q. You would not infer from that, there was no frost or ice or snow.

By Honorable Mr. Girard:

Q. You said there was not much snow at any time in that region? A. They must have snow as a general thing, but it was an exceptional thing not to have any that winter. There is plenty of snow at Fort Simpson. I gave you, I think, all the notes I have of any importance yesterday, and these are the others that I have since picked up. I do not know that I have anything more.

By the Chairman:

Q. Could you ascertain anything with regard to the possibility of sea going steamers passing through Behrings Straits and reaching the mouth of the Mackenzie? A. No, I could not.

By Honorable Mr. Kaulbach:

Q. Is the Mackenzie navigable at the mouth? A. Yes; there is no doubt of that.

By the Chairman:

Q. Have you any knowledge of expeditions in search of communication by water north of North America passing through Behrings Straits and reaching any points near to or east of the mouth of the Mackenzie? A. Yes.

By Honorable Mr. Almon:

Q. Is there any reason to believe that the cold is more intense on the magnetic North Pole than still further north? A. I do not know.

Q. Have not some voyageurs found out that when they get north of that, the cold is not more intense? A. I do not know that, but from these diaries I find out that right up near the Arctic Ocean in that new country that was explored there, a map of which I have shown you, a great deal of it was as mild as at Fort Simpson in 1862.

Q. The cold is not stationary. It has been discovered that it has been gradually moving to the westward? A. Yes; that is the case.

Q. We all know that the east coast of Greenland, within the memory of man was fertile, and at one time the Queen of Norway used to get her supply of butter made there, though the climate has since that time become so cold that butter making has been abandoned. Would that not show that if the magnetic pole does move westward, the climate changes westward with it? A. There is no doubt that the climate is changing. We have evidence in this country that the climate is changing, and we have evidence of it in the prairies of the North-West. It is getting milder all the time. I forgot to mention that while looking over some reports of my father's in letters to Dr. Richardson and Sir George Simpson, that he states there are some 84 rapids in Back's River, showing that it was not navigable to any extent.

By the Chairman:

Q. The object of your father's expedition, so far as I can learn, was to descend the Great Back or Fish River, and explore the coast near its mouth, and the Montreal Island opposite it? A. Yes.

Q. How far to the west had Dr. Rae got with his explorations? A. I could not say that.

Prof. SAUNDERS, Director Central Experimental Farm, Ottawa, appeared with a large number of samples of grain and said:—I have here some samples of Ladoga wheat of last year's importation and of this year's importation grown in 1887 and in 1888; also samples of this wheat which have been grown at the Touchwood Hills Reserve, N.W.T., at Edmonton, N.W.T., and at Binscarth, Man. The Ladoga wheats all came from latitude 60 northern Russia, near Lake Ladoga, north of St. Petersburg. I have also samples of Onega wheat from latitude 62, further in the interior; Onega oats from the same latitude in northern Russia; Petchora barley from latitude 66, northern Russia, near Petchora River, up close to the Arctic Ocean; Polar barley from latitude 67, within the Arctic circle, east and north of Archangel; Polar winter rye from the same latitude, and two samples of Danish barley from the Royal Agricultural Society of Copenhagen, Denmark. One of these samples is known as the Danish Chevalier barley and the other as Danish Prentice barley.

The weights of these different grains are as follows:—

	Lbs.
Ladoga importation of 1887, weight.....	61½
do 1888 do	62
Wheat from Donald Ross, of Edmonton, weight.....	61½
do Touchwood Hills, weight.....	64
do from R. W. Smellie, Binscarth, weight.....	65

	Lbs.
Onega wheat, weight.....	58½
Onega oats do	37
Petchora barley do	49
Polar barley do	47
Polar rye do	55½

The vitality of those seeds, as far as the tests are completed, is as follows:—

	Per cent.
Ladoga, 1887.....	98
do 1888.....	100
Onega wheat.....	99
do oats.....	96
Petchora barley.....	95
Polar barley.....	95
do rye.....	93

These tests indicate a great degree of vitality in the grain. The samples of Petchora barley, Polar barley and Polar rye have been obtained from the extreme northern limits of grain growing in Europe. I have brought before the Committee 25 1-lb. samples of each variety of grain for distribution in the Mackenzie Basin district—the Ladoga importation of 1888, and of Onega and Saxonka wheat imported last year from the Volga district in Russia.

By the Chairman :

Q. Would you inform the Committee how many of these samples come from within the Arctic circles? A. The Polar rye and the Polar barley come from within the Arctic circle, latitude 67°. The Petchora barley comes from latitude 66°, which is close to the Arctic circle. The Onega wheat comes from about latitude 62°, further down from the sea and more in the interior, and the Onega oats come from the same district.

Q. Can you tell us what the summer isotherm of that wheat is? A. I cannot, exactly. Our correspondent states that the winter rye is sown there in July of one year and reaped in August of the following year, but he has not given us the length of the summer. It is a long distance from the point where our correspondent lives up to the point of growth—400 or 500 miles—and as there is no railway communication it takes a long time to get the grain down from there—generally two or three months from the time it is ordered before it can be got to Riga.

Q. Will you kindly give the Committee any other information that was sent to you with the samples? A. I have received no information with regard to the time of planting.

Q. How long does it take this wheat to ripen in Russia? A. I have got no information on that point at present. I have written to our correspondent to ascertain that, and probably will have the information another year. Those points are not reached readily, and it takes a long time to get answers to any questions that are submitted.

Q. Have you indicated on your list of persons to whom questions of the Committee will be sent, those to whom you would like the 25 samples to be sent? A. I have not yet had time to look carefully over the list, but as I have already covered the District as far north as Edmonton and Prince Albert, and we have sent samples to Fort Vermillion, and Dunvegan and Lac La Biche. We should like if possible to have the samples distributed further north into the interior as they can be sent.

Q. We have 20 correspondents north of the point you have indicated, and we have three from the neighborhood of Sitka on the Pacific coast. Have you sent any up in that direction? A. No, not any up in that neighborhood at all. This grain coming from fully five or six degrees north in Europe of any of these points, it should be of use to the settlers in that distant country.

Q. Have you reason to believe that any considerable portion of British North America, north of the Saskatchewan watershed, may be found suitable for the production of wheat? A. I have no personal knowledge on that subject at all.

Q. What would be the conditions necessary to produce it? What summer temperature for three months, supposing the soil to be alluvial? A. It is generally held that it requires a certain definite sum total of heat to ripen wheat. What that is I cannot give you from memory, but there is a limit, and if you pass that limit it ceases to be able to produce wheat. As far as I can learn from our correspondent in Russia, in latitude 62, where we got this Onega wheat, it is about the northern limit of wheat growing in Russia.

Q. What is the summer temperature there? A. That information we have not yet obtained, there has been so little time since we opened the correspondence with this gentleman in Russia. He has taken a great deal of interest in the subject, and says he has made a study of the ripening of these northern grains for years, and is very glad to give us all the information at his disposal.

Q. The Committee have had evidence that wheat has been grown at Fort Simpson, in latitude 62, and is said to have been a crop four times out of five in that region. The summer temperature there exceeded 60 degrees for three months of the season. If other portions of the country have the same physical and climatic conditions, would you expect wheat to grow there? A. Yes, I should. There is another factor besides heat which is held by many scientific men to be of very great importance, and that is, the amount of light. Of course, as you approach the Polar regions in the summer season, you have almost continuous light.

Q. Can you tell the Committee what are your impressions as to the extent which light affects the growth of cereals? A. I think it has been pretty well established that light has a decided effect on the growth of cereals, but what exact value is to be attached to that factor in the estimate, has not yet been determined. It will require many years of careful consideration before we will be able to say how much additional light will make up for a small deficiency in heat; but that it does so to a certain extent is, I think, pretty well established.

OTTAWA, Wednesday, 11th April, 1888.

The Committee met at 11 o'clock, a.m.

The following letters were read:—

“DEPARTMENT OF AGRICULTURE, OTTAWA, 7th April, 1888.

“DEAR DR. SCHULTZ,—Professor Saunders has sent to me the enclosed explanation in reference to the samples of grain, &c., from the northern points of the North-West. I have already explained to you that all the grain we had in the Department had been transferred to the Experimental Farm.

“Believe me, &c., yours truly,

“J. LOWE.

“Honorable Dr. SCHULTZ, Senator,
“Ottawa.”

“CENTRAL EXPERIMENTAL FARM, OTTAWA, 7th April, 1888.

“DEAR MR. LOWE,—Your note of yesterday is received. I have no samples of grains, roots or grasses from the Mackenzie Basin, but am preparing for Dr. Schultz a small collection of the different cereals we have obtained for the farm from the northern districts of Russia.

“Yours very sincerely,

“WM. SAUNDERS.”

JAMES ANDERSON re-appears to make the following addition to his evidence:—
I remember well seeing at Fort Simpson seal-skin boots that came from the Arctic Ocean, purchased from the Indians.

PROFESSOR MACOUN called and examined.

By the Chairman :

Q. Are you prepared to reply to the list of questions sent to you? A. To-day I would prefer giving my own evidence—information within my personal knowledge—for the reason that I am not prepared to take up documentary evidence of others. Hence in my answers to-day I will speak only of the regions with which I am acquainted. I am prepared to give information as to the character of the Peace River from Fort McLeod, in latitude 55, on the British Columbia side of the Rocky Mountains, to Lake Athabasca; and from Lake Athabasca up the Athabasca River to the Clearwater, and up the Clearwater to its head—through the whole region to Fort Carleton or Green Lake, which is the southern border of the country covered by your investigation. In that case it includes an immense stretch of country, and I am prepared to give you details if necessary both as regards the navigation of the river, its size, the rapids, the various streams that enter into it, the character of the country on its banks, and the climate of the region.

Q. We will take first the navigation of the streams that you are familiar with in the district you have described? A. I will turn to the 7th question. In the 6th you enquire how far is the Athabasca or any of its affluents navigable for vessels drawing 30 inches of water, above the mouth of the Clearwater? I was never above the mouth of the Clearwater. Dr. Bell and Mr. Ogilvie are both competent to give information on that, because they have been above it and examined the river. As I remarked a few minutes ago I have been on the Clearwater itself. The Clearwater enters the Athabasca 180 miles from Athabasca Lake. Between the mouth of the Clearwater and the lake, the Athabasca is navigable for a steamer drawing six feet of water. In 1875 I carried out the report of Mr. Moberly, who was in charge of Fort McMurray on the Clearwater, to the Commissioner at Winnipeg, I think Sir Donald A. Smith, and that report, Mr. Moberly told me, had been drawn up at his, Mr. Smith's, instigation. He had sounded the river all the way to the fork^s, and at no place had he found less than six feet of water. That was prior to September. I came up the first ten days of September and found no shallow water.

By Honorable Mr. Power :

Q. The water would not be any lower at any time of the year than that? A. I think not, because about the 20th of September the fall rains commenced. Above the forks of the Clearwater, the river would be navigable, in my estimation, for small draft steamers, to the mouth of the Pembina River; I think possibly about 20 miles, but it may be further. Pembina is about 20 miles above—not more than that.

Q. When you say small draft steamers, what do you mean? A. There were no signs of shallow water, and up to that part it would float boats drawing three or four feet. We saw no signs of shoals at all. We were taking up those big York boats, three of them, and found no difficulty in running before the wind in that part of the river.

By the Chairman :

Q. You had better explain to the Committee, some of the members not being familiar with the class of steamers in the far west, the kind of vessels that is now being built at Athabasca Landing? A. I may mention that steamers were run eight years ago on the Assiniboine, and ten years or more ago on the Red River which did not draw more than from two to two and a-half feet of water.

Q. How much would such a vessel carry? A. Leaving out the barges, the old boat that I went out on in 1879 to Fort Ellice would carry up 100 tons, up that wonderfully crooked river, the Assiniboine. The Athabasca River, that I am speaking of, is over 20 times as large as regards volume, but not 20 times as wide.

Q. What are the Committee to understand when you speak of light draft steamers? A. I am speaking of stern wheelers.

Q. Do you mean a vessel drawing any more than two and a-half feet of water? A. A vessel drawing not more than two and a-half feet of water, and propelled by a wheel at the stern.

Q. What is the capacity? A. About 100 tons and towing a couple of barges that would carry a couple of hundred tons at least, because any one acquainted with Manitoba will remember before the railway was constructed that in this way the steamers brought all the merchandise into Winnipeg on these big barges behind the stern wheel steamers; so when I spoke of light draft steamers I meant vessels that would draw from two to three feet of water, although they say that they can run in much shallower water than that. The steamer that I spoke of in connection with the Athabasca River would be one drawing six feet of water, according to Mr. Moberly's report to Sir Donald A. Smith.

Q. How many miles of that navigation is there? A. It is 180 miles to Fort Chippewyan. There is only about 5 miles across the lake to the fort. That same steamer could run up the whole length of Lake Athabasca, and, to my own personal knowledge, it could ascend the Peace River with the exception of a short rapid that they call Boulder Rapid, for a long distance. There are just a few boulders in the channel at the rapid, but the river is of great size, and, standing on the bank and looking at it, I wrote that there would be no difficulty in a steamer running up it. Since then, having been on other rivers, I know that there is no difficulty about running a steamer up the Athabasca and up to Little Red River, where there is a fall and a rapid.

Q. How far is it by the river from this fall to the mouth? A. It is 200 miles. Now the Peace River does not enter Lake Athabasca, but a large river about 100 yards wide or more, called Quatre Fourches River, does. That river connects Lake Athabasca with the Peace River, and in the spring of the year, when the Peace River is high, the water runs out of the river into Lake Athabasca, but when the water is low, as it was when I was there in August, the water runs out of Athabasca Lake and into Peace River. The real mouth of Peace River is about 25 miles below. It falls into Slave River, but there would be no difficulty in a steamboat passing from Lake Athabasca to the Peace River in the way I mention.

Q. What is the length of Lake Athabasca? A. They call it 200 miles; I have heard that it is 250.

By Honorable Mr. Turner:

Q. What is the depth of Peace River for 200 miles from its mouth? A. There are no bars, but it is a mighty river, 1,000 yards wide.

Q. What is the depth of it? A. I cannot tell; there are no bars. I came down it at its lowest water, in the autumn.

Q. Could a vessel drawing 13 feet of water navigate that river? A. I do not know. The waters of the Peace River are like the waters of the Mississippi, they are of a milky color. They are not clear and it is only by sounding that you can tell the depth of the water.

Q. A boat drawing six feet of water anyway would be safe? A. I am sure of it, because it is a much larger river than the Athabasca, and the current was nothing, because my own aching bones settled that—we had a head wind and it was blowing stronger than the current up the river. There was no current except at the Rapide Bouillant, and which is a short rapid. These are the only two obstructions for the whole length of the river. Of course I do not wish to speak of the Peace River now; I wish to speak of it connectedly from its source the whole way down to its mouth. The Clearwater is not navigable much above the mouth of the Pembina. The Pembina is a very respectable stream coming in from the south. Before you reach the mouth of the Pembina you come to the sulphur springs that Mr. Anderson spoke of in his evidence. The sulphur springs are on the right bank of the river, and below the Pembina which comes in on the left bank.

Q. Are the sulphur springs warm? A. They are, though I am not speaking now from personal knowledge. I saw the small streams running from the sulphur springs, and they were lined with sulphur. Captain Back travelled on snow shoes down that way, and he mentions that the smell of sulphur was strong and he saw it along the margin of the creek in the month of January, so I believe they do not close, but I am not speaking from my own knowledge, but only from supposition. When I saw them there were small streams of water running from them and the bank was lined with sulphur.

By the Chairman:

Q. Is that on the part of the Clearwater that you mention as being fit for navigation? A. Yes.

Q. This sulphur then could be transported? A. Yes, by means of a steamer, because it is in the deeper water below the mouth of the Pembina.

Q. What is the extent of that sulphur deposit? A. I am not prepared to say. Dr. Bell visited that district five or six years after I was there, and he may be able to mention something on that point. On the tenth question I can give you I think full information. In 1872, I was sent by Mr. Fleming, who was then exploring for the Canadian Pacific Railway, from Edmonton, and we had the book with us that Judge McLeod spoke of having written. It was his book that caused Mr. Fleming to send me and another gentleman to explore the Peace River and see if there was a pass there. We made our way from Edmonton to the Peace River and reached the river about the last of September.

Q. What was the condition of the river then? A. When we reached the bank of the river we came upon it like as if we were walking across this room; there was no appearance of a river at all. The country was perfectly level and there was no appearance of the river until we came upon the verge almost of a steep bank—we could see the country on the opposite side of the river. Seven hundred feet below us there wound a mighty river: I have never seen a river like it in any sense. You can picture to yourself a river 800 yards wide, meandering through a narrow but very deep valley, because we were 700 feet above the water of the river. We could look to the left up the Smoky River and to the right to the sandstone cliffs, miles below us. That was in September, 1872. It is not my intention to speak to you about going up the river. I thought I would speak of what I saw on the river connectedly, commencing at its source and going down to its mouth. In 1875 I was selected by Dr. Selwyn and appointed by the Government then in power to go out as a botanist to the party led by Dr. Selwyn. I went with Professor Selwyn to the Pacific coast and crossed into the interior by the Fraser by way of Fort St. James until we came to a place called Fort McLeod. That is west of the Rocky Mountains and latitude 55°. The Peace River lies pretty near the big bend of the Fraser, near Fort George. We came into the Peace River Valley from Fort St. James. At Fort McLeod one branch of the river takes its rise. It is called on that side of mountains the Parsnip. It gets its name from the cow parsnip, which the Indians eat the stalk of like rhubarb. From there, three years before, in the latter part of October and the first days of November, we came up it with a large flat bottomed boat with four Indians and two white-men, and we found no difficulty whatever. There is not a rapid in the river at all, so we found no difficulty whatever in bringing the boat all the way from the Forks of Finlay, as it is called, up the Fort McLeod River. In going down the first days of July, 1875, the river was in flood and of course it was fit to carry a steamer of 22 feet draft in some places; but at the very lowest stage in November we found no difficulty in taking our boat up and met no rapids whatever. I am speaking now of the Peace River called the Parsnip, between the entrance of Fort McLeod River and where it enters the Rocky Mountains to turn to the east.

Q. What is the distance? A. It is about 74 miles in a straight line.

Q. What is the character of the navigation? A. In taking our boat up in the autumn we had no difficulty at all. In going down three years afterwards in spring, of course, the water was at its highest, and it was a mighty river.

Q. That is on the west of the mountains? A. Yes.

Q. What class of boats would be suitable there? A. That river would be navigable for one of those stern wheelers that draw two feet of water.

By Honorable Mr. McCallum :

Q. How much water did your boat draw? A. I cannot say. It had brought down twenty-three miners and two years' supplies.

Q. Do you know about the draft of water that the boat was drawing? A. No, because it was a common flat bottom boat built in Victoria, and they carried down perhaps ten tons on it.

Q. Would it draw a foot of water? A. No, I do not think it would, but we hauled up and poled, and found no difficulty in taking the boat up at all. I am not prepared to say that the river is suited for steamboat navigation.

Q. Part of the season it would be? A. Yes, two-thirds of the summer it would: there is no doubt of that. When I say three feet I am within half the depth that mentally I believe the draft of water to be. I am satisfied that it is six feet in the early part of the summer. When we reached the Forks of Finlay we found the river 200 yards wide, and the Parsnip 300 yards wide. These two rivers unite on the west side of the mountains, and as soon as they join, the river enters the main chain of the Rocky Mountains. Then, as it passes into the mountains, it is over 300 yards wide. Less than three miles from the Forks there is a short rapid, and for fifty miles after that, going through the mountains, the mountains towering up 5,000 feet on either hand, we met no more rapids. Only one place did we find rapid water at one or two points where rocky points came out, the water running over the rocks on one side showed a ripple, but on the other side it was only fairly swift.

By the Chairman :

Q. Do the Committee understand that you can sail a steamboat on the Peace River through the Rocky Mountains? A. No. For fifty miles in the mountains there is nothing to interfere with the navigation.

By Honorable Mr. Puer :

Q. How long was this western rapid? A. The first rapid was quite short. The difficulty was not fifty yards. We just lightened the boats and handed them down with ropes, and entered below and went on again. The year we came up in the autumn, we hauled the boat up through without any effort. After fifty miles we came to another rapid. That was just before we left the main chain of the mountains.

Q. How far was that in the mountains? A. About 75 miles through the mountains, from what we called the Peace River Canon to the Forks of the Finlay.

Q. What was the character of the second rapids? A. Boulders, and not a difficult rapid at all. It is merely swift water. When I say swift water, there was a very high bank on the left as we went down, and the stones had fallen from the banks into the water, and apparently there was a line of boulders across the river, but that was all it was. You would not call it a rapid at all.

Q. There was no steep fall of water? A. No, simply rock.

Q. Simply the current was obstructed? A. Yes, simply boulders in the stream. What is called the Rocky Mountains Canon is ten miles east of that. Then the river breaks its way through the rocky escarpment, the foot hills of the Rocky Mountains. When it gets through the Rocky Mountains it sinks down at least 1,000 feet in these ten miles.

By Honorable Mr. McCallum :

Q. There is no use in trying to get in through there? A. No.

By the Chairman :

Q. What is that portage? A. Dr. Selwyn made it ten miles; I made it 12. When you get through you are a thousand feet above the river, and that character the river retains all the way down. It runs in that deep gorge. That is why the old explorers going up the stream marked along the Peace River, "here, mountains," but the gentlemen never climbed up to see what was above. They were all the time looking at the bank of the river, because when we climbed up we found from where

the river left the mountains, it was getting lower and lower, and at the end of 500 miles it was not more than 500 feet below the level of the country, but at Dunvegan it was 700 feet. Mr. Horetzky and I measured it, and found it that distance from the level of the prairie. The country above that was found to be level as a floor. The Peace River country is without hills. I never saw a hill near the river in its course east of the mountains. Looking up from the bed of the river it is like a mountain chain on each side for 500 miles, but I climbed up at several places, and the character of the country was as I have described it.

Q. You passed over fifty miles of clear navigation; then you came to 12 miles where navigation was impossible? A. Yes.

Q. Please describe what you found below that? A. I descended the river below that for 770 miles, and for 550 miles from this obstruction you can picture to yourself a river that commences at 500 yards in width and ends at over 1,000 yards going through a valley with immense bends and when you look up from the river you can see at some places sandstone cliffs 500 feet high, and at other places the broken faces of the bank sloping back half a mile on either hand. At first there was a great deal of gravel in the bed of the river; as we receded from the mountains the gravel got finer and was without large stones, because it was all sandstone and broke up easily. As we descended further the gravel got finer until it eventually passed into mud. When we got about 300 miles below the mountain it had turned into mud bars and we saw no more gravel or stone except once in a while when we would come across where the river had been eating into the banks and we found the rocks the same as above, that is nodular, ironstone and some kinds of limestone.

By the Chairman:

Q. We want to know what kind of steamer could be run on this 770 miles of navigation? A. I see no reason at all why a steamer should not be run there. I put the depth at the very lowest when I say three feet: I mean six feet.

By Honorable Mr. McCallum:

Q. That is for two-thirds of the season? A. For the whole season. We swam our horses in 1872 across. One was nearly drowned. They had to swim over 500 yards without a break. The same season at Dunvegan we swam them back again to the other side. We found it was not so wide—perhaps not more than 300 yards there; so when I talk about the depth there is no such thing as a ford known, so that I am safe in saying—and I speak now at the time the water was at its lowest—that the navigation is good all the season. When we went down in August the river was booming, as they say.

By Honorable Mr. Power:

Q. At what time is the river highest, and at what time is it lowest? A. It is high twice. In 1872, as I said, we reached the Peace River on the 1st October. The water was low, but from some cause, I believe it was rains west of the Rocky Mountains, five days after that the water in one night rose, I am within the mark when I say, five feet, and it remained up. The Hudson Bay Co.'s people were prevented from sending their boats up to the mountains, and Mr. Horetzky and I had to hire horses and force our way overland to get to the mountains. That was the autumn flood. That is only occasionally; it is not regular, but it comes from west of the mountains. In the spring we met the flood rushing into the mountains about the 8th of July, so that prior to that the river had been rising; that was about the height of the flood on the 8th of July when we struck it at the Forks. From that until the last of August it kept getting lower all the time.

By Honorable Mr. Turner:

Q. Is that caused by the rains or melting snows? A. By the melting snows.

By Honorable Mr. Power:

Q. And the river is at its lowest when? A. About the 1st of September, because we found most of the rivers—the lateral rivers—at a very low stage of water at that time, but I suppose in winter, before the melting of the winter snows, the river would be low, but that would have no reference to its navigation.

By the Chairman :

Q. That part of the river you describe as 770 miles is open for navigation at what time? A. I am very glad you asked that, because I was particular about it. I stopped at Fort St. John, and I got permission from the officer in charge to examine their records, and I found that the first ice—not the closing of the river, but the first ice seen in the river—averaged about the second or third of November. Of course the river would not close for over a month after that. Now as regards its opening, I was there in the autumn of 1872, and as I said we went through the mountains and took the boat up to latitude 55 in British Columbia, and we passed through in the last days of October and reached Fort McLeod on the 5th of November, and there was no obstruction to navigation. On the seventh of November the Parsnip that we had gone through two days before, closed. There was nothing to obstruct the same men when they went through the Rocky Mountains; it had not closed down there. The next spring Capt. Butler went up the river and wrote his book called "The Wild North Land," and on the twenty-second of April he crossed the river, went up the slope of the bank and found the whole slope covered with blue anemones—that is, on the twenty-second of April—and the river was open before that time. So there are the two records for the winter of 1872-3.

By Honorable Mr. Power :

Q. Did not this record at the fort show the time that the river was open? A. I am not prepared from memory to say, though I think I have it in my notes.

By Honorable Mr. Turner :

Q. For agricultural purposes, starting from the Parsnip and through the Rocky Mountains, supposing that portion of the country to be unfit for agriculture, where does the good country commence? A. Right at the place where I told you the big portage was, because when I come to speak of the vegetables, I can show what will astonish you in connection with that.

By the Chairman :

Q. What is the name of that portage? A. The Rocky Mountains Portage at Hudson Hope, or the Hope of Hudson, as Capt. Butler puts it; from there it is 770 miles down the river.

Q. And suitable for agricultural purposes, how far? A. The whole distance; I mean on the prairie, not on the slopes of the river—on the prairie above, and I am prepared to prove that.

Q. Are there any mountains there at all to be seen after you get up the bank? A. None after you get east of the Rockies.

Q. And it is a fine prairie country up there? A. It is just a level prairie all the way, only there is an abrupt ascent, as geologists say, going from one class of rock to another.

Q. Are there any woods along the banks? A. Yes. The north bank of the river, that is the one facing south, has hardly any wood, but is covered with berries, and we found the cactus growing there, but the other side of the river, facing the north, was covered largely with spruce down to the river's edge, the whole upward slope. After going down the river 550 miles from the mountains, we come to the first obstruction at Little Red River.

By Honorable Mr. Turner :

Q. I suppose it is only the banks of the river that are wooded; above all is prairie? A. Yes, prairie, with polar and willow in clumps.

Q. The same as the Saskatchewan country? A. It is of the same character as the North Saskatchewan, but with much taller grass. There are ledges of limestone rock that cross the river from bank to bank, and the river we estimated was a mile and half wide there.

By the Chairman :

Q. Will you give us a description of the impediments to the navigation of the river? A. There is a rapid of about half a mile above the fall, and below the fall the water is still again.

Q. Can steamers pass that obstruction? A. No.

Q. What is the length of the portage? A. We came down the river and the rapid was not more than half a mile. It was not a bad rapid at all.

Q. You ran the rapid then? A. Yes.

By Honorable Mr. McCallum:

Q. What is the fall of the river there? A. It just depends upon the depth of the water. When we went down it would be from 7 to 15 feet.

Q. In what distance—half a mile? A. No, just at the fall.

Q. Is it a straight fall? A. Yes.

By Honorable Mr. Power:

Q. The fall is at the foot of the rapid? A. Yes; and the water becomes perfectly still after that. We held lines and let the boat go over, and although it filled with water it was easy to empty it and we got in again.

By Honorable Mr. McCallum:

Q. What is the fall of the river there? Supposing you wanted to build a canal to overcome the difficulty what would be the difference in level? A. I may say it was about 20 feet. Mr. Ogilvy went up that river and surveyed it, and he will tell exactly the height in his report. I have forgotten about it.

By Honorable Mr. Turner:

Q. Then the fall at 7 feet does not include the rapid? A. No, only the fall itself, and as I said at first, it depends on the stage of the water how much fall would be apparent. From that down the river runs through a country with comparatively low banks. I do not remember a bank much higher than 50 feet, and the character of the river was that of a narrow lake with no current at all, only at the one place I have mentioned, that is the Rapide Bouillant, the Boulder Rapid. There was no rock in place, just boulders, and we ran through the boulders ourselves. We did not get out of the boat, but we kept near the shore. Immediately after passing the fall there were limestone cliffs.

By Honorable Mr. Turner:

Q. The same on both sides? A. Yes, and below that we came to the Little Red River, and the country was not more than 20 feet above the level of the river.

Q. And both banks of the river were the same? A. Yes. The river seemed wider than from here to the Gatineau Point, and the whole country was level away into the blue distance.

Q. The banks were sufficiently low so that you could see over the country? A. Yes, and I made a collection of plants.

By the Chairman:

Q. What is the next obstruction? A. Rapide Bouillant was the only obstruction we had. It was a broad river with islands in it and perfectly smooth, meandering backwards and forwards. Then we reach the mouth of the Quatre Fourches River. We found at that time it was running cut of Lake Athabasca, and it runs into the lake in the spring.

Q. Suppose you are on a steamer of 30 inches draft at that point going down, you can get to Quatre Fourches: how much further down can you go with that steamer? A. You can go down the Peace River into Slave River and run down Slave River to 16 miles of Fort Smith. Fort Smith is on the Slave River immediately below the rapids on Slave River. Then there is a break of 13 miles there.

Q. What is the distance from Quatre Fourches to the point you have described? A. That I could not say. I did not go down; it could be measured on the map, but to pass from Peace River into Lake Athabasca we estimated was a distance of 24 miles.

By the Honorable Mr. Power:

Q. There is no obstruction there? A. No. You can go into the lake.

By the Chairman:

Q. What is the distance down the Slave River that you can go? A. I am not prepared to say without reference to other men's books, but you can go down it within 16 miles of Fort Smith. That steamer you can use down the Clearwater 200 miles, up the Peace River and at least 100 miles down the Slave River; and what is more the Hudson Bay Company have a steamer for that very service, which was in use last year.

Q. What is the size of that steamer? A. I am not prepared from memory to give the size, but it is a river steamer, not a lake boat. It is a stern wheeler, but the boat they have below Fort Smith is not a stern wheeler but a vessel fit to go anywhere in those waters.

Q. What occurs at Fort Smith in the way of obstruction? A. A series of rapids. I believe the rocks are limestone, and the rapids are from 13 to 16 miles.

A. That is impossible of navigation? A. Yes, without canalling.

Q. Below that point what have you got? A. Below that point unobstructed navigation to the Arctic Sea. The reason I say that is this—it is not a guess—the Hudson Bay Company's people have a boat on it now, and late last year the boat started at Fort Smith and went down to the mouth of Peel's River, and Peel's River enters the delta of the Mackenzie. In fact it is where Mackenzie went himself. There is no sea water there, but it is at the sea, and it gets the influence of the tide, so that it is an actual fact that a boat runs from Fort Smith to the Arctic Sea.

Q. What is the distance by the river, do you suppose, from Fort Smith to the Polar Sea? A. When I was at Lake Athabasca they told me it was 1,300 miles from there to the Arctic Sea.

Q. And Fort Smith is 100 miles below the lake? A. Yes, 100 miles or more.

Q. Would 1,200 miles be an approximation? A. Yes, but I am not prepared to say exactly.

By Honorable Mr. Power :

Q. How far is Fort Smith from Fort Resolution? A. Fort Resolution is at the mouth of Slave River, and that is 2 degrees further north, so that it is over 100 miles from Fort Smith to Fort Resolution.

By Honorable Mr. Turner :

Q. The Peace River ends at Lake Athabasca, or there changes its name? A. The discharge of Lake Athabasca is Slave River, but the Peace River enters Slave River 25 miles below Lake Athabasca. The Peace River sends in an arm, in the spring of the year, into the lake.

Q. But at its junction with Slave River it ceases to be called the Peace River? A. Yes.

By the Chairman :

Q. You have got us in the steamer to the mouth of the Mackenzie River, can you tell us of the estuary there? A. It is not from my own knowledge, but what I have learned from reading and other sources that I can speak. I believe the drift of the Mackenzie River's waters is to the eastward. Sir John Franklin and Sir John Richardson found that to be the case from the driftwood they encountered towards the Coppermine. Franklin himself, when he went westward to go to Icy Cape, found the abundance of driftwood for a short distance, and after that it ceased and the driftwood he found came from two rivers that ran into the Arctic Sea west of the mountains.

Q. Do you mention that as evidence that there is open navigation from the mouth of the Mackenzie to Behring's Straits? A. I believe there is, and the reason is very simple. We can get the records from Point Barrow, where the Americans have had an observatory for three years. The full reports from that observatory are published. The reason I think there is no obstruction and that we have a clear coast is that the drift is to the eastward. Therefore to the east among the islands, the sea is jammed up with ice just as the Arctic explorers found it to be. I believe, though I could not prove it, that no obstructions would be found at certain seasons of the year, between Behring's Straits and the mouth of the Mackenzie. I am prepared to prove that the mild climate of the North-West is not an occasional or accidental thing, but that it is permanent and that the drift of warm air from both sides of the continent seems to come up the Mackenzie River. The isothermal lines show that. The rivers in which Sir John Richardson found the timber coming down, were near the mouth of the Mackenzie River, so that I am quite sure mentally that the rush of heated air keeps the Arctic Sea open. We have hot air passing from the American desert to the mouth of the Mackenzie. The American desert is the

source of the blizzards in Dakota—the source of the good climate we have in the North-West, and the bad climate they have in the States.

Q. You have told us the effect that the heated air has on the temperature of that region; we want to confine you to the navigation; a witness yesterday told us that he had bathed in the Mackenzie River at Fort Simpson. That would imply a temperature of not lower than 80 degrees. We were told by the same witness that an immense volume of water passes northward through that river, and presumably at that temperature. What effect would that have upon the navigation at its mouth and on the adjacent coast? A. It is very easily answered. Everybody says that the heated water of the Gulf stream passing by the British Islands and the coast of Norway affects the climate of those regions wonderfully. Is it not common sense that the immense amount of water poured into the Arctic Sea by the Mackenzie will affect the climate comparatively?

Q. What about navigation? A. If it is proved that the ice drift from the Arctic comes down on this coast, my conclusion is all wrong, but I contend that the drift is to the east. I know this because the driftwood carried into the sea by the Mackenzie River is found along the coast 200 miles to the east and not to the west of the mouth of the Mackenzie.

Q. Have you talked with any one who is familiar with the navigation of Behring's Straits? A. No.

Q. Then you do not know that they are navigable? A. Yes, they are navigable; the reports of the observatory in Alaska will show that.

Q. Do you remember reading that Franklin in one of his expeditions surveyed the coast eastward from Behring's Straits, and that Simpson explored westward to the same point, getting an outline, so far as we know it, from Behring's Straits to the Mackenzie River; now they declare it to be a low coast and the water to be not unfit for navigation and not obstructed by ice. Can you add anything from your own knowledge or reading to that? A. Sir John Richardson says in his report of his trip in 1825-26—or it may have been Franklin—that if they had had boats the ice that obstructed their bark canoes would have been no obstruction at all, and they would have had no difficulty in getting through. From that I infer that the ice was not sufficiently heavy to interfere with navigation. Captain Pullen came from the mouth of the Mackenzie.

Q. In what kind of a vessel? A. A ship.

Q. A steamship or a sailing vessel? A. A sailing vessel, there were no steamships in those days.

Q. A steamship could navigate there with greater facility? A. Yes. Franklin says that although they found no whales there they found the bones of whales on the beach, and they saw immense numbers of seals. He says that the seals were so abundant they frightened away the fish from the nets, and they could get no fish in their nets.

Q. Was it Mackenzie who discovered the island at its mouth that he named the Whale Island? A. I think so.

By Honorable Mr. Power:

Q. You have told us that the Peace River drops 1,000 feet just as it comes through the Rocky Mountains: to what do you think that is attributable? A. It is very apparent there. Evidently the river at one time ran down not where it is now, in pre-glacial times. The portage I spoke of is sand and gravel, and that evidently is the old bed of the river which became filled up with silt, and the river had to break its way over the rocks and literally rush down the side of the mountains. Here is a proof of it: when we come to Hudson's Hope at the bank of the river there are immense springs of water, from which a very respectable river runs, and there is fully 150 feet of *calcareous tufa* that is formed by these springs. I deduce the conclusion that the water comes from the Upper Peace River through the old bed of the river. I may be wrong, but it seems to me that the same condition of affairs exists there that we find at the Niagara River now. Geologists say that the bed of the Niagara was formerly west of the present river, and that it entered Lake

Ontario at Hamilton, but that it became filled up with silt, and the course of the river changed. I think that is what occurred at the Peace River—the old bed at the east side of the Rocky Mountains filled up and the river found a new channel.

The Committee adjourned until 11 a. m. to-morrow.

GEOLOGICAL SURVEY,
OTTAWA, 11th April, 1888.

The Honorable
Senator SCHULTZ,
The Senate, OTTAWA.

MY DEAR DR. SCHULTZ,—I am in receipt of your letters of 9th and 10th inst. with (accompanying the former) a printed list of questions (a.) *Relating to Navigation and Communication*. In reply I may say that I shall be pleased to give any information I can. Whether orally or in writing, I would wish to do so only in relation to such portions of the country as I am able to speak of from personal examination. With the exception of certain parts of Peace River, my personal explorations have not extended to any part of the region to the north of the North Saskatchewan watershed, and therefore such knowledge as I have of the northern regions embraced in the enquiry of your Committee is entirely derived either from statements I may have heard in conversation or from a perusal of the published literature on the subject, with which doubtless your Committee is fully acquainted.

I have sent you to-day copies of the Geological Sketch Map of the Dominion on which is depicted our knowledge of the southern and western boundary of the Laurentian system from Lake Superior to Great Slave Lake. The examination hitherto made of the northern and western portions of this vast region have not been sufficient to warrant the expression of any decided opinion as to what portions of it may or may not be of economic value. The western boundary north of Great Slave Lake is shown on the map in Part R. of our Annual Report recently published.

I am, dear Dr. Schultz, yours sincerely,
ALFRED R. C. SELWYN.

OTTAWA, THURSDAY, 12th April, 1888.

Hon. William Christie, ex-member of the North-West Council, late Inspecting Chief Factor of the Hudson Bay Co. Service, now resident at Brockville, called and examined.

By the Chairman :

Q. The first question relates to the information which you have obtained by actual travel and from other reliable sources, in the region covered by our enquiry?
A. The country that I have travelled through extends from Winnipeg northwards to Fort Simpson on the Mackenzie River. I am prepared to answer any question that the Committee may put to me as to what I know of the character of those districts.

By Honorable Mr. Almon :

Q. Have you been northward to the mouth of the Mackenzie River? A. No; as far as Fort Simpson. As inspecting factor of the Hudson Bay service I was in charge of all the districts from the Red River to Fort Simpson—from Winnipeg, or as it was called then Fort Garry, northward—the Red River district, Swan River District. English River district, Athabasca River district, and Mackenzie River district. All of these were under my supervision. I have travelled over the whole of them and descended the Mackenzie River as far as Fort Simpson.

By the Honorable Mr. Turner :

Q. How far down the Mackenzie River is Fort Simpson? A. It is 300 miles down from its source.

Q. And that is the farthest you have been down the Mackenzie? A. Yes.

By Honorable Mr. Power :

Q. Was the Peace River included in your district? A. Yes, that was part of the Athabasca district.

By the Chairman :

Q. Will you pass on to the next question that you wish to answer? A. I will pass the 2nd, 3rd and 4th, because some of these I will answer afterwards. The next question in the printed circular, which I received only a few hours before I left Brockville, that I will answer is No. 5, relating to the navigation of the Mackenzie and its tributaries. To the first part of that question, calling for information concerning the navigation of the sea coast adjacent to the mouth of the Great Mackenzie River, I would say that I can give no information, as I was never down on the coast. The second part of the question, asking my opinion as to whether whaling and sealing craft, if built at the head waters of the Mackenzie River, could descend to the coast early enough and ascend the river late enough to permit of some months of fishing near the mouth of the river, I would say, yes. I do not think there would be any difficulty in building craft at the head of the Mackenzie to descend to the mouth of the river, remain there for some time and return the same year, because last year we had an instance of a successful voyage of the Hudson Bay Co.'s steamer from Fort Simpson down the Mackenzie River nearly to its mouth—below Peel's River. They could have gone through to the Arctic Sea if they had wished to do so, but having no pilot, and not knowing which of the channels they should take, they did not like to venture. The Mackenzie discharges its waters into the Arctic Sea by several mouths. It would have been a disastrous thing to the Company if that steamer had met with any accident which would have prevented it from returning to the Slave River that season.

Q. The Hudson Bay Co. have now on the Mackenzie River a steamer capable of running from Fort Simpson to the sea? A. Yes, a vessel which did so last summer.

By Honorable Mr. Power :

Q. Where does the first interruption of navigation take place coming up the Mackenzie River? A. There is no break to the navigation of the Mackenzie. Supposing we are going in by the Mackenzie; at present the route open to the Mackenzie River for taking in supplies is by railway to Calgary, thence by waggons to Edmonton, and from Edmonton by waggon road 90 miles to a place called Athabasca Landing. There they have built a steamer this summer that runs from Athabasca Landing to the head of the rapids on the Athabasca River.

By the Chairman :

Q. That is how far down by the river? A. Between two and three hundred miles from the Landing to the head of the Grand Rapids.

By Honorable Mr. Turner :

Q. Is there a good depth of water there? A. Yes, because the company are building a steamer now to run this summer there on that break of navigation. Up to the present they have been using bateaux, and will have to use them from the head of the Grand Rapids to the 60 miles of rapids that I will presently tell you of. At the Grand Rapids you have a chain of very bad rapids—the worst in the country—all the way down to Fort McMurray, a distance of 60 miles. At Fort McMurray the company have a steamer, and for four years it has been running from Fort Chippewyan down the Slave River to the next obstruction, which occurs in the Great Slave River. It consists of five rapids close together, which can be passed by a waggon road, and they have done so. They built a steamer four years ago at Fort Smith, at a place which used to be called Salt River, and this steamer has been in operation two years. From Fort Smith there is no obstruction to the navigation of the river northward to the Arctic Sea.

Q. What is the distance in round figures from Fort Smith to the Arctic Sea? A. Of course it has never been measured, but it is about 60 to 100 miles down the Slave River to the Great Slave Lake; then 250 miles across the corner of Great Slave Lake to the head of the Mackenzie; that is Fort Providence. There is a Roman Catholic mission which goes by the name of Providence, and the Hudson Bay Company have

an establishment there. Now, from Providence to the sea there is the length of the Mackenzie River which I took myself when I was at Fort Simpson, from Sir John Franklin's narrative of his first and second journeys on the Mackenzie. I read them very carefully several times over. From the Big Island or Fort Providence, at the head of the Mackenzie River to Fort Simpson is 203 miles; from Fort Simpson to Fort Norman, the next post down the river, is 271 miles; from Fort Norman to Port Separation, 434 miles; from Port Separation to the sea, 129 miles—total length of the Mackenzie from its source to the Arctic Sea, 1037 miles, according to Sir John Franklin.

Q. That is from Fort Providence to the sea; what is the distance from Edmonton to Fort Providence? A. From Edmonton to the landing on Athabasca River is 90 miles. That is the distance stated by Senator Hardisty, who served many years with me on the Saskatchewan. He does not give the distance from the Landing to the head of the rapids. I have been down there myself, but I cannot give you the exact distance.

By Honorable Mr. McCallum:

Q. What is the depth of the water? A. The company's steamer that went down drew five feet of water. There is much deeper water than that. I have here a photograph of the steamer that runs on the Mackenzie now. The sixty miles of rapids occur above Fort McMurray, and is the only great break there is to be overcome. There are steamers for the rest of the way. If they had tram-ways for that sixty miles it would be easy travelling by that route.

By Honorable Mr. Power:

Q. What do you call the source of the Mackenzie River—is it the Great Slave Lake? A. Yes. The waters of the Great Slave Lake fall into the Mackenzie, and the Mackenzie is a large river, with an average width of a mile and a quarter. It maintains that breadth all the way down from Fort Simpson to the sea. It is a noble river.

By Honorable Mr. Girard:

Would it be possible, by the expenditure of a reasonable amount of money, to have the obstructions removed from the Long Rapids and that part of the river made navigable? A. Never. It is sixty miles of the worst rapids in the country. I intended to go and examine the rapids when I was there, but it was too late in the season.

By Honorable Mr. Turner:

Q. Have you any idea what the fall would be in that distance of 60 miles? A. No.

Q. It must be a very heavy fall? A. I should think so; it is rapid after rapid. There is one long Sault of 20 miles in itself, and in the spring when the water is high the waves are enormous. I have run many a bad rapid, but these are the worst I ever saw. These rivers in the spring of the year, when the thaw takes place in the mountains, are something magnificent. The Athabasca in July, is an immense river a mile and a half wide.

Q. Is it possible for any kind of a vessel to go down these rapids? A. No.

Q. Everything has to be portaged over? A. They make large bateaux and have eight or ten men in each, and by means of strong cables they lower these boats. They took in the machinery for the vessel at Fort McMurray that way. One of the boats was wrecked on the way and eight or ten men were nearly drowned. They lost some two hundred pieces, and the men had to swim to shore. It is a very dangerous piece of navigation.

By the Chairman:

Q. You have given us the width of the Mackenzie River at Fort Simpson, could you give us the approximate depth? A. I see Mr. Hardisty quotes his brother's authority, and mentions six feet. I should think it was a great deal more than that. Vessels considerably larger than that steamer would have no difficulty going down the Mackenzie River or up the Slave Lake and Slave River to Fort Smith.

Q. It was stated here the day before yesterday that a small class of sea-going steamers could ascend the river as far as Fort Smith from the sea? A. Certainly, there would be no difficulty at all. From Fort Chippewyan to the head of the rapids—that is the five rapids together about 13 miles from Fort Smith—is 100 miles. The land portage to avoid these rapids is 13 miles. I have sailed from Fort Chippewyan to the head of the rapids in a day, the boat starting from Fort Chippewyan in the forenoon. The water there is very deep. You can go all the way from Fort McMurray down there with a vessel drawing six feet of water. They use a stern wheeler there. When you get to Fort Smith they have a sea-going vessel which stands a good sea. Slave Lake is very deep and large, and immense seas rise there. This vessel built for that service is a very good boat and has stood very severe gales.

By Honorable Mr. McCalum :

Q. Is the steamer made of wood or iron? A. Of wood.

By Honorable Mr. Turner :

Q. Is the water of the Great Slave Lake very deep? A. Yes.

Q. As deep as Lake Superior? A. Yes. The point we crossed from Fort Resolution coming out of Great Slave River and crossing a corner of the lake is 250 miles. There are very few harbors—only one or two, and not good ones at that. There are two harbors, I think where a steamer could run to, and there are islands before you reach the head of the Mackenzie—say about three harbors where a vessel could find shelter.

By the Chairman :

Q. To convey to the Committee a clearer idea of the navigation of that region, we will ask you to transport twenty tons of freight from Edmonton down to the lowest port on the Mackenzie River. Tell us the land carriage and the boat carriage? A. From Edmonton to the landing is 90 miles.

Q. That is by waggon? A. Yes. Then there is the Hudson Bay's steamer—they have one building there now—which could take the goods to the head of the Grand Rapids, a distance of, we will say, 200 miles—I am not certain about the miles, but Mr. Hardisty said it was somewhere about that. Then you have 60 miles of rapid.

Q. How would you transport the 20 tons of goods there? A. They would have to build bateaux there, or if the company had bateaux, and would take the freight, it could be carried by bateaux.

Q. Then it was not impossible navigation? A. No, it is not impossible, but it is a very dangerous and expensive navigation.

Q. What is the character of the banks—is it suitable for waggon roads? A. Yes, I think the north bank would be. Mr. Hardisty and I discussed that matter and agreed that there would be no difficulty in making a road over that 60 miles down to Fort McMurray.

By Honorable Mr. Turner :

Q. There is no road in there yet? A. No, none whatever.

Q. So you have to send the freight altogether down by bateaux. A. Yes.

Q. Can they pull those bateaux up again? A. I think so.

By the Chairman :

Q. How do the furs come up? A. I am not certain, but I think they send them by Lacrosse, the old way. At Fort McMurray there is a steamer which runs to the head of the rapids on Great Slave River.

By Honorable Mr. Almon :

Q. Are the Indians in the habit of running those rapids in their canoes? A. No, there are no Indians to my knowledge that go back and forth on the river there. They hunt from Lac la Biche up and down the river, but I do not think they could go through there with their canoes.

Q. Do you know how high the tide goes up the Mackenzie River from its mouth? A. No, I have not been down the river far enough to learn that.

Q. Have you heard that the tide runs up there? A. I have no doubt, from what I have heard, that the tide does ascend the Mackenzie River, but I cannot speak of it from my own knowledge.

By the Chairman:

Q. The Hudson Bay Company have had no trade on the coast and it is only for Arctic exploration that they have descended to the coast. You have got the goods now to the head of the rapids on the Slave River? A. Yes. There is a waggon road of 13 miles from that point to Fort Smith.

Q. That is the last transportation by land? A. Yes, that is the last. Then from there you have the Mackenzie River steamers. One is called the "Wrigley" and the other the "Graham." The "Graham" is the Athabasca steamer.

Q. From what I make out by these figures there would be a navigation from Fort Smith to the sea of 1,360 miles? A. Yes.

Q. I make out that to get goods from Edmonton to the sea there is a land carriage of 163 miles—60 miles at the first rapids on the Athabasca, 90 miles of waggon road from Edmonton to Athabasca Landing, and 13 miles of these obstructions at Fort Smith; would that be generally correct? A. Yes.

Q. And there is only 60 miles of road to be built? A. Yes.

Q. And that you think could be built? A. Yes. By bateaux it is a very dangerous navigation. A tramway or railway could be built on the north side easily.

By Honorable Mr. Turner:

Q. What you call the north side is the left hand side going down? A. Yes. Whilst I am talking of the navigation of the Mackenzie, I would like to make this observation to the Committee: During the search for Sir John Franklin's lost expedition, Commander Pullen, of H. M. S. "Plover," sailed from Honolulu for Behring's Strait and Mackenzie River. He went as far north as he possibly could get with the "Plover." Then with Lieut. Hooper and some sailors he took to the boats and coasted along to the outlet of the Mackenzie River. The party ascended that river with their boats to Fort Simpson the same fall—tracked their boats. The "Plover" returned to Honolulu that same season. A private yacht, the "Nancy Dawson," kept company with the boats for some days longer after the "Plover" left them. This was a yacht owned by a private gentleman who came almost within sight of the mouth of the Mackenzie. The "Plover" was a very slow sailing vessel, but she should have accomplished more the first year than she did. I think they had to winter at Honolulu the first winter, and the second year she started for Behring's Straits.

By Honorable Mr. Power:

Q. Do you know how far north the "Plover" got? A. No.

Q. Do you know what stopped her? Was it ice? A. I do not know. I merely mention that as a fact, that boats have come from the Pacific to Behring's Straits, coasted along to the mouth of the Mackenzie and ascended the Mackenzie to Fort Simpson. The first fort they came to was Peel's River, then they reached Good Hope and then Fort Simpson.

Q. Do you know anything about the character of the shore and the water close to the coast west of the Mackenzie River? A. No, I do not. I have never been down on the sea coast there.

Q. Your company has been doing business for a long time out in that country, and been moving goods in and sending furs out; have the company ever undertaken to get their goods in or send their furs out by the Mackenzie? A. No, never.

Q. Why? A. I suppose they found it easier and cheaper to adopt the old route. It is very uncertain navigation, the Behring's Straits. It is better to send them the way they are doing.

Q. You think the navigation by Hudson Bay is more certain than the navigation by Behring's Straits? A. I think so.

Q. And when you get to Hudson Straits you are a great deal nearer home? A. This is the shortest way through Canada.

Q. You know of no instance where goods have been brought in for the company by way of Behring's Straits and up the Mackenzie River? A. No, none whatever. It is a long distance. Even for the trade at the head waters of the Yukon it is not done. The Yukon has a course of 1,500 miles from its source to the ocean. For the trade on the Yukon we used to take the goods down the Mackenzie and across the mountains. It is only a short distance across from the waters of the Mackenzie. Peel's River is the lowest post on the Mackenzie.

Q. Do I understand you to say that the supplies for the ports on the Yukon were not brought in by way of the Yukon River? A. No. They went by way of Fort Simpson from the east. A proposition was made to me by an old officer in that district who strongly advocated that, but it was not approved of. Material would have had to be brought to build a steamer somewhere about the mouth of the Yukon, and the post was about 1,500 miles above the mouth of the Yukon. Besides that, we had to leave the Yukon. It was found by astronomical observations that Fort Yukon was within American territory, and the company had to abandon it and establish a fort at that river, or Porcupine River.

Q. There is Fort Reliance? A. That was a fort established at the time of the Arctic expedition.

Q. Do you bring the goods up the Churchill or the Nelson? A. No. The goods that we shipped from England for trade in the Mackenzie district, before they received their return from these goods was seven years. They were shipped to York Factory, and remained there a winter. Requisitions were received, of course, three or four years ahead from the Mackenzie River. They were packed up at York to fill the Mackenzie River requisition and sent to Norway House.

Q. How would you go? A. Up Hayes River, Hill River and through the lakes up to Norway House.

Q. Whereabouts was Norway House? A. Norway House is at the north end of Lake Winnipeg, on Jack River.

Q. Then I suppose up the Saskatchewan from there? A. Yes, up along the north end of Lake Winnipeg, past the Grand Rapid and to Portage la Loche to the head of navigation.

Q. To Edmonton? A. No, not to Edmonton at all then: that was the old route.

By Honorable Mr. O'Donoghue:

Q. Does the Mackenzie fall by more than one mouth into the sea? A. By several. It has a number of branches as it gets near its mouth.

Q. How wide is the widest? A. I do not know. I have never been there, but the river has an average width of a mile and a quarter, and as it gets near the outlet it has several mouths—there are several islands.

By Honorable Mr. Power:

Q. Do the Hudson Bay Co. use ocean steamers now, or do they still confine themselves to sailing vessels going to Hudson Bay? A. Sailing vessels. But the great bulk of the goods coming out comes through the settled portions of Canada, and sometimes by way of New York, by Cunard steamer sometimes to New York, and to Montreal by the Allan Line. They have only two small vessels trading to Hudson Bay: one goes to Moose Factory, and the other to York.

By Honorable Mr. Almon:

Q. From your own experience can you say how long the Hudson Bay is open? A. I was eight years on the coast and the latest any vessel left there was the 4th October and she got home, but it was touch-and-go.

Q. What is the earliest date at which you have known the Straits to close? A. I should say that the straits are navigable for four months at the most.

By the Chairman:

Q. I have before me an Admiralty chart with the observations of Franklin, Richardson, Simpson, Cooley, Pullen, Hooper, Murray, Collinson, and MacGuire in 1856 with corrections and additions in 1851. I wish to ask you some questions

relating to your superintendency there. You had men stationed at Fort Good Hope? A. Yes.

Q. Do you know anything of the character of the river there, from the reports of these men? A. No. We had very little to do with the depth of the water in the river, or anything like that. We were merely connected with the fur trade. There is a fort for the Esquimaux at Peel's River, that is the lowest coast. The steamer was down below Peel's River last summer. A few of the Esquimaux trade at the Peel's River post.

Q. What do they get from the Esquimaux there? A. Wolf and fox skins.

Q. Do they get any seal? A. I should think so. Possibly they would not sell, because the skins would not pay the transport such a distance. I was four years in charge of Fort Churchill and traded with the Esquimaux, and we never traded seal skins much with them: they are used principally for making Esquimaux boats.

Q. Have you reason to believe that there are many seals at the mouth of the Mackenzie? A. I cannot say because I was never there, and I do not want to state anything that I do not know anything about, but that information could be got from the circular sent from the company's office.

Q. There is an island at the mouth of the Mackenzie River called Whale Island. Do you know if whales are found there? A. I know from narratives of expeditions that I have read that whales were seen outside of the mouth of the Mackenzie. There are no salmon in the Mackenzie. In talking with Mr. McFarlane last spring he told me that there were no salmon there.

By Honorable Mr. Turner:

Q. The seals found there are quite different from the seals captured at Behring's Straits? A. Those valuable seals are only found in Alaska. There is only one group of islands where those seals are found. It is a very curious fact that they come there and disappear and no one knows where they go. The Indians know when they make their appearance and go and hunt them.

By Honorable Mr. Power:

Q. What sort of fish are there in the Mackenzie River? A. Gold eyes. There are plenty of whitefish at Great Slave Lake. Fort Simpson has no resources of its own, and they are mainly supported by fish caught at the Big Island in Great Slave Lake and brought down by boat to Fort Simpson. There are whitefish and other fish in the Mackenzie, plenty of them in the summer—gold eyes and others.

Q. Are there trout? A. There might be.

By Honorable Mr. Turner:

Q. They speak of a fish there that has no tail? A. The liver of that fish is the only good thing about it.

Q. What is the name of that fish—it has been spoken of as the "Inconnu"? A. Some person has given evidence here that the large trout in Slave Lake is the "Inconnu." The Inconnu is called Back's Greyling, and is about the size of the whitefish, shaded blue, with dark spots on the side.

Q. Is there anything peculiar about the bones of the fish? A. No. I remember when at Fort Churchill once I was out hunting with an interpreter there. We had a small net with which we caught a fish and he told me that was the fish that these expedition people called the unknown fish. It resembled exactly the engraving I have seen in Sir John Franklin's narrative of his voyages.

By the Chairman:

Q. Coming back to the navigation of the Mackenzie River, I notice that this chart gives immediately off its mouth the depths of the soundings—24 fathoms, 27 fathoms, 21 fathoms and 16 fathoms: now have you any reason to believe that when you get into the mouth of the river there is any obstruction of any kind? A. I should think not. An immense river like that must have a principal channel, though it is divided into several channels.

By Honorable Mr. Turner:

Q. And that channel would always be kept clear? A. Yes, naturally.

By Honorable Mr. O'Donohoe :

Q. Do you know if statistics have ever been collected by any authority in reference to the region in question? A. No, not that I know of.

Q. I mean in the same line that we are now considering? A. No, I never heard of any. You see our business was confined to the fur trade, and when there was any scientific expedition to be sent out or anything of that kind to be done, there was always some one sent by the British Government. We had always something of the kind going on at different times.

Q. Question 6 relates to the Athabasca above the mouth of the Clearwater? A. This same steamer that I told you of which runs from Fort Chippewyan runs from the mouth of the Clearwater up the Clearwater, towards Portage la Loche.

Q. How far? A. Somewhere about eighty miles. She ran to the foot of the first portage as you ascend the stream. That would be the fifth portage coming down the stream from Portage la Loche.

Q. How much freight would you carry? A. About 130 tons. She is a stern wheeler.

By Honorable Mr. Power :

Q. The rapids on the main stream, the Athabasca, are above the mouth of the Clearwater—the sixty miles of rapids that you speak of? A. Yes, that is what is called the Little Athabasca River. At Fort McMurray, where it meets the Clearwater River, it is called the Great Athabasca, or the Athabasca River proper.

Q. Is not Lesser Slave Lake a pretty large lake? A. That is to one side altogether.

Q. Is it navigable? A. Yes, the steamer they are building this summer is to go to the post at the end of Lesser Slave Lake. Coming down from the landing the first day you come to Lesser Slave Lake River, falling into the Athabasca, and you ascend that river by steamer and go on to their post at the end of Lesser Slave Lake, which is 100 miles long.

Q. The sixty miles of rapids are between Lesser Slave Lake and Fort McMurray? A. Yes. When we leave the landing we are going down the Athabasca River, which descends from the mountains, from Jasper House. The first river of any considerable size that you come to is the Lesser Slave Lake River. Ascend and go up Lesser Slave Lake River to the post at the end of Lesser Slave Lake.

By the Chairman :

Q. What is the length of Lesser Slave Lake River? A. I suppose about ninety miles. We take a day to run it going down stream with a boat.

Q. Then you have 190 miles of navigation from the mouth of the river to the head of the lake? A. Yes. Mr. Hardisty puts it at 200 miles.

Q. Is that as far to the west towards the Rocky Mountains as you can get with a steamer? A. Yes, just now. We are now discussing the route from Edmonton to the Arctic Sea. Lesser Slave Lake is to one side. I have given you every information up to Lesser Slave Lake. We have not touched the Peace River yet.

Q. We want to know how far you can ascend the Athabasca River? A. By steamer up to the first portage, about 80 or 90 miles.

Q. As I understand it, these are all waters that can be traversed by that steamer that carries 130 tons? A. Yes; of course in giving the number of miles I may be incorrect.

Q. The ninth question calls for information regarding the Liard River? A. The Liard River comes down from the mountains and falls into the Mackenzie at Fort Simpson. Fort Simpson is built on an island formed at the junction of the two rivers.

By Honorable Mr. Power :

Q. How large a river is the Liard where it runs into the Mackenzie? A. I suppose it is a quarter of a mile wide there. The inland boats go up that river and take seventeen to twenty days tracking to go up.

Q. Do you mean the ordinary boats carrying four tons? A. Yes; four or five tons.

Q. There would not be much navigation in that river if they have to portage?

A. No; Fort Liard is close up to the mountains—about 300 miles, I suppose, that is the average distance the company's forts are from each other.

By the Chairman:

Q. Can you give any information regarding Peace River both to the east and west of the Rocky Mountains? A. I can give you no information of the country west of the Rocky Mountains. I have passed my whole life east of the Rocky Mountains. On the east side the Peace River is a fine large river when the water rises from the freshet. There are two obstructions to the navigation—you might say there is only one they are so close to each other. Two or three miles of a road would cover them. From Fort Chippewyan up to Dunvegan there is an uninterrupted navigation for steamers, barring these two falls, of 700 miles—say 200 miles below the falls and the rest above. I see it stated at 700 miles from Dunvegan to Fort Chippewyan. The two falls are close to each other like the steps of a stair. When I ascended the Peace River in 1862 with canoes, we camped there to make the portage and it is only about two miles.

Q. If you were establishing a means of communication there, what would you put to overcome this obstruction? A. I would make a tramway there.

Q. About what length? A. The road would be two or three miles long.

By Honorable Mr. Power:

Q. Is there not too great a fall there in a short distance for a railway or a tramway? A. No.

By Honorable Mr. O'Donoghue:

Q. Would not a canal do there? A. I think the cheapest way would be to have a horse tramway or railway there to get over it.

By the Chairman:

Q. Would you mention to us the width and depth of the river so far as you know it? A. We went up in a canoe. The inland boats which go up draw from two feet of water, and they have no difficulty.

Q. Have the Hudson Bay Co. every used a steamer on it? A. No, not yet.

Q. Why have they not done so? A. The difficulty of getting the machinery in, I should say. They have a steamer to Lesser Slave Lake. When you get to Lesser Slave Lake you have to portage 80 miles before you strike the Peace River, and I presume if they were to take the machinery in they would take it that way.

By Honorable Mr. Power:

Q. Is there a road through there now? A. Yes, I think since I left the country fourteen years ago they have made a cart road.

By Honorable Mr. Turner:

Q. The river above Dunvegan is narrow, is it not? A. I do not know how far you could go up. I suppose you could ascend to St. Johns, the next post, with a steamer running above those falls. If I was going to establish steam communication on the river, I would have one steamer from Chippewyan to the falls and one from the falls to St. Johns. When I went there in 1862, I was at Fort Chippewyan on the 27th July, and left the 29th, and we were 17 days ascending the Peace River. The river was very high and we had hard work about half the way, until the water would fall and we could get the men to track. We went on until we reached a point where we could go by horses to Lesser Slave Lake. If there had been a steamer then there would have been no difficulty running on the Peace River for there was plenty of water there.

By Honorable Mr. Alexander:

Q. Besides the Hudson Bay Co.'s people, is there any white population there? A. Yes, now there are missions and traders.

Q. What churches? A. Both Roman Catholic and English Church.

Q. Are there many traders? A. Yes, they are going way in up as far as Great Slave Lake.

Q. They go in there for furs? A. Yes.

Q. They take with them blankets and various things to trade with the Indians?
A. Yes, they go from Edmonton to Lesser Slave Lake, and now there are some of them wintering at Great Slave Lake.

Q. Do I understand now that persons, irrespective of the Hudson Bay Co. are free to trade with the Indians? A. Yes, and we oppose them the best way we can. You know we sold that country to the Canadian Government.

By the Chairman:

Q. Properly speaking, I suppose the country sold was all the land which was watered by streams flowing into the Hudson Bay; the Peace River country would not be included in that? A. No.

By Honorable Mr. Alexander:

Q. Do those people ever attempt to take whiskey there secretly? A. Not that I have ever heard of.

Q. Have you ever known the Indians there to suffer from want through not being able to get fish and game? A. Lots of times. When they get in that state they used to come to the company's forts and we always relieved them.

Q. Do you think from what you saw there that two or three thousand Indians could go from another part of the country and get their living there by hunting, being supplied by the Government in case of necessity? Would it be prudent to have them go there? A. No, and I will tell you why. These larger animals are becoming scarce now, moose as well as everything else. In the Athabasca district they used to be very numerous; now they are not. When I say the Athabasca district, I include Peace River. The Peace River country used to be a grand moose country at one time. Moose skins could be got in abundance, now there are none. The resources of the country are barely sufficient for the Indians that are there now, and you could not introduce others without risking the starvation of those who are there. When I went to the Saskatchewan in 1843, the plains were literally teeming with buffaloes—millions of them.

Q. Are fish very abundant in the waters of that northern country? A. Yes, in all those lakes you can get whitefish.

By Honorable Mr. O'Donoghue:

Q. Do the Hudson Bay Co. carry on their trade now where they did before the sale of the country to Canada? A. Yes, all over. They have posts everywhere but they have to import the goods adapted to the changed condition, to sell to the settlers and people coming into the country.

By Honorable Mr. Power:

Q. Have you any idea what time the navigation closes and what time it opens on the Peace River? A. I suppose it is similar to the Saskatchewan—I suppose it closes about the 17th of November. It may be later than the Saskatchewan, but that is about the time at Edmonton.

Q. And it opens when? A. About the middle of April.

By Honorable Mr. Turner:

Q. The fall of water is much greater in Peace River than in the Saskatchewan?
A. I think so.

Q. Would it not be likely to break up the ice earlier? A. Yes.

By the Chairman:

Q. Give the general character of the Beaver River and the lakes along the upper part of the Churchill River? A. I am not acquainted with the lakes above the Churchill River, but the Beaver River was brought prominently before the public in the retreat of Big Bear from Fort Pitt after the battle there at Frenchman's Knoll. The Beaver River from Green Lake to Isle à la Crosse Lake, the upper end, is crooked, with small rapids. Below the rapids to Isle à la Crosse Lake it is a deep river, and then there would be 200 miles of unobstructed navigation to the mouth of River la Loche. I have no knowledge of the lakes on the upper Churchill River.

By Honorable Mr. Power:

Q. Does the Beaver River run to the Churchill? A. No. The Beaver River takes its rise in some lakes back of Fort Pitt—it is about 60 miles back to Fort Pitt.

We used to use it for taking pemmican down the Beaver River to Green Lake. It passes Green Lake and goes on and empties into Isle à la Crosse Lake. Then indirectly it does flow into the Churchill River, or the English River, because it flows into Isle à la Crosse, and the water goes down from Lacrosse to the Churchill.

Q. By this map it would seem as if there were continuous water communication from Lake Athabasca to the Churchill River? A. No, because you would come to Portage laLoche, and that is a height of land. At the east end of Portage laLoche you could go by portages down to the Churchill River with an Indian canoe.

Q. How far up the Churchill River is it navigable? A. It is a very flat river. The tide comes up about five miles from the mouth, and then above that it is spread out and very shallow, and only navigable for canoes like that. Boats never went up that way.

By the Chairman :

Q. Talking about the incorrectness of these maps, I have before me from my private library a map published by the Hudson Bay Company, or one of their prominent shareholders in 1866, derived from their sources of information. Our maps here represent the Great Slave Lake as being perhaps 250 miles long; this map shows it to be, although somewhat narrower, longer than Lake Superior? A. I should think it is, for this reason: From Fort Resolution, or the outlet of Great Slave River, we run just across the corner of the lake to Fort Providence, and that is 250 miles. It extends northwards to the barren grounds, and I should say it is nearly as large as Lake Superior. If it is 250 miles across the corner, it must be a very large lake. I know there is a very heavy sea on at times. I have been on Lake Superior in the old times and seen the sea that sometimes rises there, and there is as heavy a sea on it.

Honorable Mr. TURNER suggests that it would be 600 miles long.

WITNESS—I should think so. Crossing the corner of it we were wind bound for two days, and the sea that came in from the north led me to believe there was a vast expanse of lake in that direction. The Hudson Bay Company have a fort at the head of the lake for trading with the Indians there, so I fancy the shores of the Great Slave Lake extend far down towards the barren grounds.

Q. They come very near the source of the Great Fish River, I suppose? A. Yes.

Q. I notice the same difference—not so great a degree however—in the case of Lake Athabasca. It is represented here as being much longer. Do you know anything about it? A. It is not as large as Great Slave Lake, but it is a large lake also.

Q. About how long is it? A. I should say about 250 miles long, because they also have a post for trading with the Chippewyans that hunt in the barren grounds, which extend away to the Polar Sea.

Q. Talking about other navigation, I suppose these rivers, such as the Coppermine and Back's Great Fish River, which flow into the Arctic Sea, have practically no navigation? A. No navigation from what I have read. I have read every voyage and description connected with the Arctic Ocean very carefully—Back's, Dr. Ray's, and the whole of them—and I should say that the navigation of the Coppermine and Back's Great Fish River is very dangerous, and that could never be useful for any practical purposes.

By the Honorable Mr. Girard :

Q. Is any other party using these rivers for navigation except the Hudson Bay Company? A. No, none whatever.

Q. I suppose that time will come? A. Oh, certainly, it probably will.

The Committee adjourned until 11 a.m. to-morrow.

OTTAWA, Friday, 13th April, 1888.

MY DEAR SIR,—In reply to your enquiry of yesterday's date, I hasten to inform you that the most northerly post offices in operation in the North-West Territories,

with respect to the Mackenzie River Basin, are Prince Albert, and Edmonton, distant respectively from Fort Chippewyan on Lake Athabasca, by the tracks ordinarily followed—Prince Albert 674 miles and Edmonton 537 miles.

Any correspondence in the custody of this Department intended for the Mackenzie River district would be confided to the Hudson Bay Company, whose main line of communication of its Mackenzie River posts is understood to be *via* Prince Albert or rather Carleton on the Saskatchewan.

I am, my dear sir, yours very respectfully,

W. H. GRIFFIN,
Deputy Postmaster General.

The Honorable Dr. SCHULTZ,
Chairman, Senate Committee, Room No. 17.

SENATE, COMMITTEE ROOM No. 17,
OTTAWA, Friday, 13th April, 1888.

Honorable Mr. CHRISTIE re-appears and his examination was continued as follows:—

By the Chairman :

Q. Upon the map we find a lake laid down as Reindeer Lake. It seems, on the map, to be as long at least as Lake Athabasca? A. It is not nearly so large a lake as Athabasca?

Q. Can you give the Committee a general description of that lake? A. It is not so far north as Isle à la Crosse, on the old boat route going into Fort Resolution. At a place called Frog Portage a stream comes down from Lac du Brochet. The lake is called Reindeer on the map, but Deer Lake is the name.

Q. Had you a post in that district? A. Yes. The Hudson Bay Company's voyageurs used to call it Lac du Brochet. There is a post at the north end of it for trading with the Chippewyans, who hunt in the barren grounds between this lake and the sea coast. The extent of the barren grounds may be judged from the fact that the Chippewyans who came from Deer's Lake in the winter used to take seventeen days to come to trade at Fort Churchill. That gives some idea of the extent of the barren ground from that point towards the sea.

Q. How would you describe roughly the southern limit of the barren grounds? A. I suppose they would extend nearly to Seal River beyond Churchill on the coast.

Q. Is the lake that you have mentioned on the southern limit—Deer's Lake? A. No, it is in the interior; it is just on the edge of the woods.

Q. And the barren grounds are north of that? A. North-east of that. The barren grounds lie between Deer's Lake and the sea.

Q. In your opinion what lies between Deer's Lake and Lake Athabasca? A. There is a long distance between the two.

Q. What is the character of the country? A. Swamp and rock.

Q. Any timber? A. No, not of any size. Following the boat route to Portage la Loche going up that way, the whole country to Isle à la Crosse Lake is rock and islands covered with small trees. There is no land fit for cultivation there.

Q. Would you call that the barren grounds? A. No, what is known as the barren grounds proper is land without woods or anything lying between the forest and the sea coast. It is the resort of the reindeer in the summer. The reindeer of the barren grounds are to the Chippewyans what the buffalo were to the Plain Indians in the olden times. There are large numbers of reindeer there.

Q. Is there any danger of starvation among the Indians at that lake? A. No, I do not think it.

Q. Will you please give the Committee an idea of the general character of the Mackenzie River country? A. The Mackenzie River is a noble stream from its head at Big Island, Great Slave Lake, to the sea. It runs a course of 1,037 miles,

according to Sir John Franklin, and has an average breadth of a mile and a quarter. At Fort Simpson it is about that breadth. The Hudson Bay Company have a screw steamer running on the river and around Great Slave Lake and up the Slave River to Fort Smith or Salt River. I may mention here in passing that Salt River falls into the Great Slave River, and derives its name from the fact of their being salt springs about a day's journey inland from Slave River. The springs boil up and evaporate and the salt is left there quite pure. It is used on Lake Athabasca and Mackenzie River. The Hudson Bay Company's employes shovel it at the springs quite pure.

Q. How far up the river are the springs? A. About a day's journey, or two days. They generally go by land with pack horses.

Q. Would that be 50 miles up Salt River? A. About that. It is not far up the river to what is called the Salt Plains.

Q. Are there more than one of these springs? A. I should think so. They can get any quantity of salt there that they want.

By Honorable Mr. Turner :

Q. Does the water boil up hot or cold? A. I think cold.

By the Chairman :

Q. Would you please give us information regarding Lake Athabasca, particularly as regards its navigation? A. The Athabasca Lake is a large body of water, well stocked with fish, extending northward towards the barren grounds. There is a post at the north end of the lake—Fond du Lac, for trading dry provisions and grease from the Chipewyans who hunt the reindeer in the barren grounds. It is a great resort for wild fowl passing south in the fall. They alight there in millions, geese and swans, to feed.

Q. That is in going south? A. Yes, and on their way back in the spring.

Q. Are there many swans? A. Yes.

By Honorable Mr. Reesor :

Q. How does Lake Athabasca lie from Lesser Slave Lake? A. North-east from Lesser Slave Lake. In reply to the latter part of question 13, I may say that there are no mines there as yet to my knowledge. Very good wood can be got near the end of Athabasca River, where it falls into Athabasca Lake.

By Honorable Mr. Girard :

Q. For building purposes? A. Yes, they get good wood there.

Q. What kind? A. Pine.

By Honorable Mr. Turner :

Q. What diameter? A. I suppose the largest would be 11 to 12 inches.

Q. Is it real pine, or Norway spruce? A. Real pine.

By Honorable Mr. Reesor :

Q. Are the seasons long enough to ripen the cereals? A. I do not think it. In the Athabasca district, the lower part of it, you might raise some vegetables in gardens, but for farming purposes there is no land there or in the Mackenzie district.

Q. Is the country suitable for cattle raising? A. The difficulty of raising hay would prevent that. Below Peace River there is no land fit for cultivation or pasturage. It is very barren.

Q. You mean north of Peace River? A. Yes.

By Honorable Mr. McClellan :

Q. You spoke about red pine and spruce? Is that abundant? A. Yes, that is found more or less near most of the company's posts. I know near Edmonton, on the Saskatchewan, we always had plenty of it.

By Honorable Mr. Girard :

Q. How about fish? A. In the Athabasca Lake there are plenty of fish, white-fish.

Q. Is the supply of fish there larger than is necessary for the Indians? A. I do not think it. Of course if there were different fishing points on the lake, I have no doubt fish could be got at almost any place. Of course the Hudson Bay Co. have

their fishing places near the forts and get fish there, but I have no doubt if people were to fish in other parts of the lake they would get fish there too.

Q. Do you think there could be an organization formed to export the fish? A. No; at that distance, I do not think it would pay. It might pay to export fish from Winnipeg, but not so far north as that.

Q. At Winnipeg the supply of fish is not large enough for trading purposes, and they say that the fish are fast disappearing from Lake Winnipeg and Lake Manitoba? A. There are plenty of sturgeon in Lake Winnipeg, at Grand Rapids, and near Norway House.

By Honorable Mr. Turner :

Q. Are there any other fish than whitefish in Athabasca Lake? A. I think they get these large trout in Lake Athabasca—it is natural to suppose that they do. I cannot say from my personal knowledge, I was just passing through there. On all the expeditions that I was connected with, we had to spend a day or two at each post as we went along, and they had plenty of whitefish. The main support of the people in that region is the dried reindeer meat that they get from the Chippewyans from the barren grounds. That is the main support for the Athabasca district, and you will find it is the same for the Mackenzie River.

By the Chairman :

Q. How far from the end of the lake do the barren grounds commence? A. Not far I should think. I have not been there and cannot say from my own knowledge.

Q. Do they extend down to the Mackenzie? A. No, they extend down to the coast. North of the Great Bear Lake you find the barren grounds still. The Hudson Bay Co. have a post at the end of the Great Slave Lake, for the same trade in dried reindeer meat. That is what the Indians bring from the barren grounds.

By Honorable Mr. Turner :

Q. Do they not bring in furs? A. No, not in the summer.

Q. Are there no furs thereat all in the barren grounds? A. They get them in winter.

By Honorable Mr. Reesor :

Q. Why is that large district called the "barren grounds"? A. Because there is no timber or anything there.

Q. Is there no grass? A. No, there is only moss. The reindeer resort there in large numbers in the summer time to avoid the flies. They resort there in immense bands. The Indians watch for them and kill them in large numbers in crossing the streams.

Q. Do they live on the moss? A. Yes, and as the cold weather comes on, the reindeer draw up to the woods.

By Honorable Mr. Girard :

Q. Are reindeer found there still in great numbers? A. Yes, I think so, but they change their crossing places very often. Sometimes when a great number are killed at one place, they will shift their track to another place. I call it crossing the country. Some two or three years ago they had a great many deer at York Factory, and for years before that they had seen none. The reindeer must have changed their course going from one part of the country to another.

Q. Have you heard of deer pemmican being made? A. Yes, they make some, but it is not very good, they may make it at the forts themselves after they trade for the meat and grease. They do not make much because we had to send all the pemmican for the north from the Saskatchewan.

Q. What kind of pemmican do you get from the Saskatchewan? Do you get any buffalo pemmican now? A. No, not now.

By Honorable Mr. McClellan :

Q. You say you know of no mines at the Athabasca Lake? A. No, none.

Q. What is the character of the rocks? A. They are just rocky islands, coming into the Athabasca Lake, covered with stunted pine—something similar to what you see coming down through the Thousand Islands.

Q. Is the rock a conglomerate? A. It is a hard rock, similar to what you find in the Thousand Islands.

Q. Have you anything to say in reply to the latter part of the questions—"other products available for transportation by water?" A. No, I am not aware of any other at present.

By the Chairman:

Q. Was it from the head of Great Slave Lake that Sir John Franklin and other Arctic voyageurs took their departure in trying to reach the Polar Sea? A. No, Sir John Franklin's expedition went down the Mackenzie.

Q. But there have been other expeditions that took their departure from the head of Great Slave Lake? A. Yes; Sir George Back's expedition went down Back's Great Fish River, as it is called.

Q. It is recorded in these expeditions that they had to carry their provisions with them. Did they use the provisions of the country or did they carry provisions in with them? A. They took pemmican and flour, I think.

Q. Deer pemmican? A. No, I think it was pemmican supplied from the Saskatchewan.

Q. And the flour? A. The pemmican and flour were supplied by the Hudson Bay Company for the expedition, the same as the Simpson expedition.

Q. Sir John Franklin, I believe, was in this city in 1827—in fact he assisted Col. By and other gentlemen prominent then in laying the first stone of the lock down here for the Rideau Canal. That was on the occasion of his first expedition up the Mackenzie? A. I think his expedition up the Mackenzie was in 1821.

Q. He was here in 1827; had you met him? A. No, I never met him; he was before my time.

Q. The next question calls for the same information regarding Great Slave Lake? A. It is a very large, and supposed to be a very deep lake from the heavy sea that rises there, when the gales occur in the fall. The west end of the lake is crossed in going from Fort Resolution at the mouth of the Great Slave River to Fort Providence, the entrance to the Mackenzie River. Harbors are scarce on that side—the west side of the lake.

Q. Does this boat, the photograph of which you showed us, cross the end of the lake? A. Yes, that is the route.

By Honorable Mr. Turner:

Q. What kind of timber is there on that lake? A. Small stunted pine trees on the low ground round the lake.

Q. Is there any agricultural land there? A. None whatever. It is the most miserable barren country you could see, at Fort Resolution especially.

Q. Is that lake supplied with fish? A. There are whitefish. At Fort Resolution, when I passed there in the fall, they had a good stock of whitefish. The fishing was over. They lived mainly upon fish in the winter and the dried reindeer meat that they get from the Indians.

Q. What relation do the barren grounds bear to that lake? A. At the north end of that lake the Hudson Bay Company have a post the same as on the Athabasca Lake. It is called Fort Rae, and it is established for the purpose of trading with the Indians for provisions.

Q. And the barren grounds extend north of that? A. To the east between the Great Slave Lake and the coast. The barren grounds are all along the sea coast, from the north of Churchill going up northward.

Q. And extending how far back? A. I cannot say. The Indians who came to trade at Churchill, as I have told you, took 17 days to go from Reindeer Lake to Churchill.

Q. Are there trout in the Great Slave Lake? A. Yes, because we got some from the Indians in the winter coming back, on my return.

Q. How large are they? A. About the size of Lake Superior trout—I suppose about 20 or 30 lbs. It is the same trout as they catch in Lake Superior.

By Honorable Mr. Reesor :

Q. Are there any other animals there suitable for food besides the reindeer? A. The reindeer is the principal animal. Of course there are rabbits, but they are very scarce in the north.

Q. The musk ox is not so much to be found there? A. No, it is found down on the sea coast, but the musk ox is very scarce.

Q. Its flesh is not considered desirable for food? A. No; and, as I have said, the musk ox is very scarce. They are not like the buffalo, which used to be found in immense herds, they are found in small bands of three or four together.

By the Chairman :

Q. The next question asks for information regarding Great Bear Lake? A. I can give you no information regarding Great Bear Lake, because I never was there; but, like all the inland lakes, it is very large. Its outlet is by the Great Bear River into the Mackenzie. It falls into the Mackenzie near Fort Norman. The Hudson Bay Company have a post on the Great Bear Lake.

Q. What is the name of that post? A. I do not know any particular name to it; I suppose it is known as the Great Bear Lake post.

Q. The Experimental Farm has favored us with a number of samples of wheat, barley, rye, &c., from Russia, which we propose to send, with questions, into the interior; could you suggest the posts that these should be sent to? They have already sent up samples as far as Duvegan, on the Peace River? A. You might send samples to Fort Chippewyan, that is the headquarters of the district, and ask the officers in charge there to distribute it through the district. Do you want to try further north?

Q. Yes, everywhere. A. Of course things will grow up towards the mountains that would not grow down towards the sea coast. If these are hardy grains from the north of Russia that you wish to test in the north, I may say there is no land there for it. At Fort Chippewyan the little garden they have there is made, and it is the same at Fort Simpson.

Q. How could we get specimens sent from Edmonton to the interior? A. There is no use talking of settlers in the Athabasca or Mackenzie River country, because there is no land there for cultivation. It is different with the Peace River country, which is one of the finest countries that you would wish to see. If the Senate wish to know whether the heat of summer in that northern latitude is sufficient to ripen these grains, you could send the samples as far north as Peel's River, but for any other purpose it would be of no practical use whatever. The posts to which you could send the samples are Fort Chippewyan, Fort Smith, Fort Providence, Fort Simpson, Fort Norman, Good Hope and Peel's River. I do not know that you need send the samples to Peel's River, because that is within the Arctic circle, and so I believe is Fort Hope.

Q. Have you ever heard that barley has been grown at Fort Yukon? A. Yes, but that is much further south and it is much milder there than at Fort Simpson. It is much milder at Fort Liard also?

Q. Shall we add Fort Liard to the list? A. Yes, but that is up near the mountains and it is much milder there.

Q. The 16th question is as follows:—If you know of any other body of fresh water, such as the Lesser Slave Lake, give all possible information relating thereto? A. There are a great many lakes, all over the territories, as large as the Lesser Slave Lake.

Q. We meant more particularly between the Hudson Bay and the Athabasca and the Great Slave Lake? A. There are no large lakes south of Deer's Lake and between it and the sea coast that I am aware of.

Q. Can sea-going steamers ascend the Mackenzie? If so, how far and with what draft of water, and during what period of the year? A. It depends upon the draft of water of the steamers. I have no doubt, from what I have seen of the river, that a vessel drawing a great deal more than the Hudson Bay Co.'s steamer there, could navigate the river. The steamer draws five feet of water. I have

descended the Mackenzie as far as Fort Simpson late in the fall, arriving there on the 21st of October. As we went down the river was full of ice, but we had no difficulty. We had heavily laden boats drawing two and a half feet of water. Mr. Hardisty says that the water is nowhere less than 6 feet deep, but it is a great deal more than that.

Q. Can you tell us anything about the salmon in the rivers that flow in the Hudson Bay from the west? A. That is about Churchill, I suppose?

Q. Anywhere of importance on the coast; I suppose that Churchill is the most important point on the coast? A. Yes. Salmon is found in large numbers on the Churchill as soon as the ice clears out of the river. The river breaks up there about the 28th of June, and the ice is clear about the middle of July.

Q. Do they run up the river to spawn? A. No, they enter the river with the tide and go out with the tide.

By Honorable Mr. Turner :

Q. Are the salmon there as large as those that are found on the Labrador coast? A. I suppose so. I thought them as large as the salmon I had seen in Scotland.

By the Chairman :

Q. Where is their spawning ground? A. I do not know. They do not ascend the river far, but they seem to go in and out with the tide. Churchill is the only harbor at that part of the Hudson Bay post.

Q. Can you give the quantities of rain and depth of snow of any part of the Mackenzie Basin, to which you have referred? A. We have kept no registers of that. We used to keep a register at York Factory and Churchill of the thermometer, but we kept no record of the snow and rain-fall, or anything of that kind.

Q. Can you give us an idea of the depth of snow at Fort Simpson and other points? A. From Fort Simpson, coming out, we left the fort on the 5th December. You may say we spent the whole of the winter crossing from there to Ottawa here. We got here on the 8th March. We found a great deal more snow southward than on the Mackenzie River. Perhaps there might be from two to three feet of snow on the level. Of course on the Churchill there are immense drifts of snow.

Q. There is not so deep a snowfall then on the Mackenzie River? A. No, I do not think so. Of course I had started from Fort Simpson on the 5th December, and travelled southward. We used snow shoes all the way, but I found as I came south, and especially as I came to Ontario here, that the snowfall had been much greater than we had found it in the north.

By Honorable Mr. Girard :

Q. Is that a rainy country? A. I have here some extracts from my inward journal from Fort Garry to Fort Simpson. While at Fort Carlton on the 5th and 6th of September, there were heavy rains. On the 19th and 20th September, heavy rains and gales at Isle à la Crosse. The night of the 7th October, fearful gales at Fort Chippewyan with snow. There was a foot of snow on the ground on the morning of the 8th, and the bays were full of ice. In the notes from my journal on the outward journey, I have noted here deep snow from the Forks to the edge of the plains.

Q. What date was that? A. December. Heavy rains at Fort Simpson on the 19th November. At Fort Simpson, on the 22nd November, the thermometer registered 10° below zero, I started on the 5th December coming out, and we had excessively cold weather at Great Slave Lake. Weather excessively cold from the 11th December. I had officers with me who had wintered on the coast and they thought it was at least 50° below zero. On the 15th January the weather changed milder going south. Heavy rains at Isle à la Crosse on the 18th January.

Q. Do you consider the cold weather which you have described, the usual weather in that country? A. I should think so.

By Honorable Mr. Power :

Q. You have not said anything with regard to the most important part of the Mackenzie Basin—the Peace River country—in answering this question? Do you

know anything of the snowfall and rainfall in that part of the country? A. I was in the Peace River in the summer time in 1862.

Q. Can you tell us anything about the rain-fall? A. No. We did not keep any register of the rain-fall. I can tell you the nature of the country as we passed through.

Q. Perhaps you may know, from the reports of other officers to you, what is the usual depth of snow in the Peace River country? A. I do not think there will be any difference much between it and the Saskatchewan. I never wintered in Peace River, and I do not think the company's officers pay much attention to the rain-fall, the depth of snow or anything of the kind.

By Honorable Mr. Girard:

Q. There is more snow there than in Manitoba, is there not? A. No, I do not think so. The snow in Upper Peace River would go away much sooner than in Manitoba, because as you approach the mountains the climate is much milder.

By Honorable Mr. Power:

Q. Do you think that the Peace River country is liable to drought at all? A. No, I do not think it. The Upper Peace River is as fine a country as I ever saw.

By Honorable Mr. Reesor:

Q. Is the vegetation luxuriant? A. Yes. It is not like the Saskatchewan country. The grass of the Peace River country is more like the grass of Manitoba.

By Honorable Mr. Girard:

Q. I know that for pasture there is no better country in the world than the Peace River Valley, but is the soil as cultivable as that of Manitoba? Can crops be relied on? A. Yes, I think wheat would be as certain in Peace River as in the Saskatchewan country. At Edmonton wheat is a very uncertain crop. It is likely to be affected by early frost.

By the Chairman:

Q. How is it further down? A. At Lac la Biche they never have wheat frozen; that may be affected by the temperature of the lake water.

By Honorable Mr. Reesor:

Q. On the Upper Peace River they are less subject to frost? A. Yes, I have always understood that wheat grows well at Dunvegan.

Q. Do you remember the elevation of the country there above the sea level? A. No.

By the Chairman:

Q. Can you give us any information as to the depth to which the winter frost penetrates the soil at different places in the Mackenzie Basin? A. I should say in the Mackenzie River the ground is frozen to a depth of 6 to 10 feet.

Q. You mean by that about Fort Smith? A. No, not so far south as that—from the posts on the Mackenzie downwards—the far north. It does not thaw much out in the spring and summer.

By Honorable Mr. Reesor:

Q. The frosts would remain there the year round then? A. Oh, yes.

By the Chairman:

Q. South of that, can you give us the depth to which the frost penetrates at the various points? A. No, I cannot do so with any correctness. Of course coming south it would be less. About the coast of Hudson Bay, at such places as York Factory and Churchill, the frost is never out of the ground.

By Honorable Mr. Chaffers:

Q. What about the days and nights? A. In the winter the nights are very long, in the summer very short—in fact at midsummer there is hardly any night at all. Down on the lower posts on the Mackenzie I do not think they have any nights at all in the summer. At Fort Simpson I arrived there on the 22nd of October and left on the 5th December, and it generally used to be dark about three or half past three in the afternoon. Then we had a long night until the next day perhaps nine or ten o'clock. At Fort Churchill in midsummer there is just a sort of twilight of a couple of hours; the rest of the day it is all daylight. In winter, of course, the

nights are very long; it is dark generally about half past three or four in the afternoon, and daylight does not come before nine o'clock the next day.

By Honorable Mr. Girard :

Q. What are the Hudson Bay Company's posts on the Mackenzie River? A. They are established about every 300 miles all the way down the river. Then there are other posts on the lakes. Fort Simpson is ahead of the Mackenzie River district. Then the next post going down the river is Fort Norman, and they have a post on the Great Bear Lake. There are Sisters of Charity at Fort Good Hope, and at Fort Providence; they have a splendid mission.

Q. Have the Sisters of Charity gardens there? A. Yes, a very fine garden. Wherever you meet the Sisters of Charity in that country, you find a well cultivated garden.

Q. Do they grow many vegetables? A. Yes, and flowers.

Q. Do they raise potatoes? A. Yes, at Fort Providence they raise potatoes the same as at Fort Simpson. The potatoes raised in that country are known as the "Lady's Finger." They raise potatoes and barley at Fort Simpson.

Q. Do they raise vegetables at Fort Good Hope? A. Yes, some potatoes, and they raise barley when they can.

Q. What is the size of the potatoes grown there? A. They are very small.

Q. Is there any considerable settlement around any of those forts? A. No, none at all; I do not think any white man would go to settle there.

Q. Where are the white men to be found there? A. Such as there are, at the company's forts. A great many came out from England and Scotland, gentlemen's sons—and some got married to Indian girls.

Q. And French Half-breeds? A. Yes.

Q. How are they living? A. At Fort Simpson entirely on fish, and they were very badly off last winter and the winter before. I have a son stationed at Fort Simpson.

Q. How do the Indians live? A. By hunting.

Q. Have you witnessed any starvation? A. Sometimes, when they are not successful in hunting, long ago they have starved on the Mackenzie River, but lately I have not heard of any cases of starvation. When the Indian has anything to eat he does nothing at all until that is done; when that is finished he looks for more.

Q. Can they always find fish for food? A. No, some of them do not know much about fishing, or making nets, but at Fort Simpson and around the lake the principal food is fish and reindeer meat.

Q. You spoke of the Grey Nuns; I think they have settlements at different parts of the Mackenzie Basin? A. Yes.

Q. At Lac la Biche? A. Yes; Lac la Biche is on the Saskatchewan. Bishop Clut is the Bishop for the Mackenzie River country.

By the Chairman :

Q. You told us a little while ago that the reindeer come to the wooded district in large bands by different ways, and that the Indians wait for them at the crossings of the streams and kill them in large numbers, and dry the meat for winter use? A. They make dried meat in summer time, but the reindeer in coming up from the barren grounds in what we call passes through the country, do not always follow the same route. For instance, if a great number are killed in one place, they change their track.

Q. Is it not a fact that sometimes the Indians lie in wait for them at a place where they have been accustomed to pass, and when the reindeer change their route the Indians fail to procure their usual supply of food and starvation is sometimes the result. Have you not heard cases of that kind? A. Yes; in the summer time the Indians go to the barren grounds, to hunt, and knowing the passes at the rivers, they lie in wait for the reindeer, and spear them in large numbers.

Q. No Government interference could prevent or foresee an occurrence of the kind I have described causing starvation among the Indians? A. No.

Q. Even those who are in command of that district could not prevent that? A. I never heard of any case of starvation among the Indians during the four years I was at Fort Churchill.

Q. I speak of the Mackenzie River district? A. I did not hear of any. Of course, sometimes an Indian will starve when he fails to kill anything. Sometimes the deer are found in large numbers in one part of the country, while the Indians are hunting for them in another part of the country, where there are none.

By Honorable Mr. Power :

Q. You have not yet told us the depth to which the frost penetrates the ground in the Peace River country? A. I cannot make any statement about that; I never made any attempt to find out, but I should think it would be about two feet, something similar to the Saskatchewan.

Q. Something similar to what we have in this part of the country? A. Yes.

By the Honorable Mr. Girard :

Q. In what respect can the basin of the Mackenzie be considered of value to the Dominion? Is it a mineral country? A. I will answer that question this way : it will depend on what discoveries may be made. It is a known fact that all the streams from the mountains, south of Saskatchewan even, and going north, are auriferous—that is to say, indications of gold are found in them. I make that statement from what I am told by miners who have gone up as far north as the Liard into the mountains. Then we have from the journals of the Arctic expeditions—Franklin, Richardson and others—that on the Coppermine River, copper exists in large quantities. Of course I am only speaking now of what I have read.

Q. As a fur country what do you say about it? A. I am a retired officer of the Hudson Bay Company, and I would prefer to say nothing about that.

Q. Could any part of that country be used for agricultural purposes? A. No, there is nothing at all in the Mackenzie River country or the Lower Athabasca country. There is no part of it that is fit for agriculture.

Q. The Upper Peace River country you consider good? A. The Upper Peace River at Vermillion is a splendid country. I rode with Governor Dallas 60 miles through a most magnificent country. The soil was a beautiful dark loam, as we saw by the mole hills, and we were struck with the charming appearance of the country. There were more bluffs than you find on the Saskatchewan, and it was a beautiful country all the way up to Dunvegan.

By Honorable Mr. Reesor :

Q. Where the country was open did you find the grass very high? A. It was higher than on the Saskatchewan. It was not very long—about the same as in Manitoba. As to the capacity of the country for agriculture, I may explain that a good deal depends upon the character of the officer in charge of the fort, whether the capacity of the country for agriculture is tested. In the journals of long ago I find that they used to raise splendid wheat crops at Dunvegan, and cattle. Another officer, without any taste for agriculture, going in there might find it very difficult to live. If he has no taste for gardening or agriculture nothing will be raised. A great deal depends on the officer of the post whether he lives well or not. If he is active and energetic he will always live very well.

By Honorable Mr. Girard :

Q. I suppose the Peace River country is a considerable size—in fact there is enough land there to make a new province? A. Yes, I sometimes hear the opinion expressed that our country may ere long become over populated, but there is not the slightest danger of that. You need not be afraid how many immigrants come in to the country to settle. You may bring in all the immigrants that Europe can send you. There is room for all in the Saskatchewan and Peace River country. There is a vast extent of splendid country from Prince Albert on the whole north side of the Saskatchewan, going away up until you come near Fort Pitt, keeping a little to the north. Then when you come to the route of Green Lake, there is two days' journey through a magnificent country, beautifully timbered, well watered and supplied with abundance of fish. As I travelled through it, I remarked to one of my men, "what a splendid country to settle in."

By Honorable Mr. Power :

Q. Whereabouts is Green Lake? A. North of Carleton, about 80 miles. You cross at Carleton and for two days you travel through a prairie country with bluffs here and there, and lakes; it is a splendid country. Then you travel for two days through a forest to Green Lake.

Q. Is that good timber? A. Yes, it is a dense forest.

By the Chairman :

Q. We will take now the 2nd series of questions, commencing with No. 24. Where are the barren grounds? A. Extending from the west coast of Hudson Bay to the heads of Deer Lake, Athabasca Lake, and the Great Slave Lake. The barren grounds, so far as I know, are not rocky. It is all open country, covered with reindeer moss. The sterile country would be in Athabasca. The country is all rocky and there is no soil—rocky islands.

By Honorable Mr. Turner :

Q. Does the Mackenzie country come under that head too? A. You cannot say that it is altogether sterile, but you cannot raise any crops of any significance in the Mackenzie country.

Q. Just little patches of land? A. Yes.

By the Chairman :

Q. Of course in that district you speak of as being sterile there is Fort Simpson, and there you raise potatoes? A. Yes.

Q. You have stated of course these are small potatoes, of the "Lady Finger" variety. As I understand it the "Lady Finger" is a small variety of potato. Since the time when these were raised great improvements have been made by the introduction of the "Early Rose," "Morning Skies," and "Beauty of Hebron." Do you think that different varieties of potatoes might not grow larger? A. Of course when the same seed is used time after time it tends to get small, and no doubt when other varieties are introduced better potatoes will be grown.

Q. How far north have barley and potatoes been grown, and how far to the east and west on various parallels of latitude? A. I should say as far north as Fort Simpson, on the Mackenzie River.

Q. No potatoes or barley have been grown north of that? A. Not that I am aware of. Possibly at Fort Good Hope they have raised potatoes, but I cannot speak with any certainty.

Q. How about Fort Yukon? A. I cannot say.

By Honorable Mr. Turner :

Q. How about Churchill? A. You can grow nothing there. That is on the shore of the Hudson Bay.

Q. There is nothing grown there at all? No. We used to have a few turnips.

By Honorable Mr. Reesor :

Q. I suppose the ice continuing until very late in Hudson Bay, tends to keep the atmosphere cold there? A. Yes, very likely; because in Manitoba, when the ice in the lake hangs on for a long time, and it is very cold weather, they attribute it to the ice on the lake. I suppose we may say the same of the sea.

Q. How far north, east and west have the hardy varieties of Indian corn arrived at maturity? I suppose not being an agriculturist yourself, having been devoted to quite other pursuits, you cannot answer very readily these questions relating to the agriculture of the country? A. I do not think I could say anything which would be of use to the Committee.

By Honorable Mr. Girard :

Q. Have you ever seen Indian corn grown in the gardens at all? A. No, never. I never saw an experiment tried, and I have no idea how far north it would grow. I believe a little wheat was raised as far north as Fort Chippewyan, but that was merely an experiment. The Committee would perhaps get better information with regard to cereals from Professor Macoun than from me.

Q. When does the spring open in these different localities, meaning by spring the first appearance of flowers? A. That is as soon as the snow is off the ground

almost. In the prairie country, as soon as the snow is off the ground the flowers come up.

By the Chairman :

Q. When does the snow leave the ground at Fort Simpson? A. I suppose about the middle or towards the end of May.

By Honorable Mr. Girard :

Q. How long before the flowering of plants at any of these places is the ground fit for seeding? A. Just as the snow goes. You have to wait until the ground is dry and the frost is out of it before you can plough. The flowering of plants takes place before the ground is fit to plough.

Q. Does the land dry early? A. Yes, very soon after the snow disappears. In the Saskatchewan the ploughing generally commences about the 10th or the middle of April.

By the Chairman :

Q. Take the 33rd question: Are June, July and August warm months? A. Yes. In Saskatchewan it is a little earlier than that. The seed is sown about the first of May sometimes, or the latter end of April or earlier. Ploughing commences about the 15th of April, and sowing would be five days later—about the 22nd to the 25th of April. All is over, the seeding done generally, by the 5th or 10th of May, and then the growing months are June, July and August there. Then in the northern districts it may be much the same, because they would be later getting in the seed. It would be the latter end of May in the Athabasca and Mackenzie River districts before they would put in seed, and so the growing months are June, July and August.

By Honorable Mr. Girard :

Q. Have you frost generally in August? A. In the Saskatchewan sometimes.

Q. Towards the end of the month? A. Yes, about the end of the month, but generally about the beginning of September—about the 5th of September.

By the Chairman :

Q. About what time have you your first frost in the Mackenzie River district? A. I was not there in the summer; I was only there in the winter and cannot tell.

By Honorable Mr. Girard :

Q. Have you heard of frost in July in any part of the country you have visited? A. No, it is the end of August and the beginning of September generally—crossing the plains sometimes about the beginning of September.

Q. When do the leaves begin to bad? A. Early in May at Edmonton, and I presume it is much the same at Peace River.

Q. There is not a great deal of difference between there and Manitoba? A. No. That is what I say, there is not a great deal of difference in the winters of those two districts, Peace River and Manitoba.

By the Chairman :

Q. The 53rd question calls for information regarding the animals of that country which are valuable for food. Is the cariboo found there? A. The cariboo exists in the barren grounds.

By Honorable Mr. Girard :

Q. Where do they find food? A. They eat the moss, they live upon it.

Q. I thought they needed grass also, and I understood you to say that there was no grass in the barren grounds? A. There is no grass there, but they do not require it. They live on the moss.

By Honorable Mr. Reesor :

Q. How high does this moss on which they feed grow? A. It is quite low and crisp. The cariboo lives entirely in the barren grounds on this moss, and in the winter they come up to the end of the woods for shelter.

Q. About where is that? A. Along the edge of the barren grounds, and they go into the woods and scatter over it.

By Honorable Mr. Girard :

Q. I suppose that is for protection against the flies? A. Yes, in the summer they go to the barren grounds and down to the coast. When hard pressed by the

flies they actually go into the sea, they are so tormented with the "Bulldogs." The Indians say that the "Bulldogs" sometimes kill the deer. For a long time I did not credit it, until one time we came across the body of a deer that had been killed in that way, and it was literally covered with "Bulldogs." The whole body was alive with them, they were in the eyes and nostrils and mouth of the animal in swarms. They literally choked the animal to death.

By the Chairman :

Q. Can you tell us anything of the appearance of the musk ox? A. The musk ox is not like the buffalo. It does not stand quite so high. It has a very long straight back, with very short legs, and the wool is very long and hanging down almost to its hoofs. The musk ox does not go very much in the deep snow. It is a very hardy animal of course. The horns are not like those of the buffalo, but more like those of the mountain sheep.

By Honorable Mr. Girard :

Q. Is it larger than the buffalo? A. Yes, a full grown one would be larger. It is longer in the body and much heavier.

By the Chairman :

Q. What is the food of the musk ox? A. Something similar to the reindeer moss.

Q. What is its enemy? A. The Esquimaux hunt them, but we get very few skins from them. We get a few at Fort Churchill and a few at Fort Rae.

Q. The musk ox inhabits a district north of that in which the reindeer is found? A. Yes, north of the Churchill and to the north of the Mackenzie River.

Q. With the exception of the cariboo, he is the most northern animal of all? A. Yes, even more northern than the cariboo. He is the largest animal found in the Arctic circle.

Q. Does he seek the shelter of the woods? A. No, he keeps in the open country, along the coast.

Q. And the wood buffalo? A. The wood buffalo inhabits the Peace River country. In speaking of the Salt River, I mentioned the fact that there are plains there known as the Salt Plains. The wood buffalo are in the woods, but in the summer they come down to these salt springs to lick the salt. They are peculiarly in the Athabasca country—not in the Athabasca or Peace River country proper; they only find them on the Salt River that flows into the Great Slave Lake River. The Salt River plain is about their country.

Q. Are they to be found on the Liard River? A. No, the Salt River that falls into the Slave River at Fort Smith.

Q. Have you any idea, from your correspondence, what numbers of them remain? A. No, I could not tell you the number, but they are in small bands of four or five together. The same remark applies to the musk ox north of Churchill. A few are to be had, perhaps, within 100 miles of Seal River.

Q. We are now speaking of the wood buffalo? A. They are to be found entirely in the Great Slave country, on the plains of the Salt River.

Q. Would you describe the appearance of the wood buffalo? A. The Esquimaux have brought them to us frozen, just as they shot them. They are different from the plain buffalo. They are longer and deeper in the sides. They have very short legs and the wool is much longer. The robes are very much prized. The centre is light colored, a sort of drab.

Q. Will you describe the general appearance of the wood buffalo? A. The wood buffalo is the plain buffalo, only in this respect: long ago the buffalo were found as far north as the Peace River in great numbers, and these Plain Indians, the Sarcees and others, were once in the Peace River. There is a place called Battle River in the Peace River Valley where these Plain Indians had a tremendous battle, and it is called Battle River from that circumstance. These plain buffalo were in that country then in thousands, just the same as they were in the plains. As they got hunted up by the Indians, they moved out and the Indians moved out of the Peace River also after this great battle and went into the plains.

Q. How long would that be? A. A long time ago—perhaps 100 years ago. A number of those plain buffalo got into the woods and bred and remained there, and are still living in the woods there. They have grown larger in some way, but they are just the same as the plain buffalo. Those who have killed some of them say they have increased in size in the woods, possibly from not being disturbed so much and not having to move about as the plain buffalo had to do.

By Honorable Mr. Girard :

Q. How do the wood buffalo live there? A. In the woods, on the grasses, I suppose, that they find. The buffalo does not scrape; he breaks the snow with his nose and eats that way.

By Honorable Mr. Reesor :

Q. Unless the grass is pretty long he could not get his living there in the winter? A. No.

By the Chairman :

Q. Do you know anything of the weight of one of those wood buffalo? A. I suppose about four or five hundred pounds would be the weight. A buffalo cow in the plains, after being dressed, would weigh about three hundred pounds; one of these wood buffalo would weigh about three hundred and fifty to four hundred pounds, dressed.

Q. Can you give us the locality of the moose? A. The whole of the Peace River. The Upper Peace River used to be celebrated for moose, and the Mackenzie River also. They were very numerous in both districts once, but they are not so now.

Q. Have you the elk there also? A. The red deer is there.

By Honorable Mr. Reesor :

Q. There is the red deer, the elk and the moose; the moose is a very large deer? A. I think the red deer is what you call the elk. There are several different species of deer. With us we always thought the moose was the largest, the red deer next, then the jumping deer and several species of small deer.

PROFESSOR MACOUN—The red deer and elk are the same.

By the Chairman :

Q. We now come to the 56th question, with regard to the climate of the region covered by our inquiry? A. No, I have no records at all bearing on the climate. Of course it is extremely cold in the northern districts—much colder than it is in the southern districts.

By Honorable Mr. Girard :

Q. Is the influence of the chinook winds felt in any part of that country? A. Yes, at Jasper House and Rocky Mountain House, and at Bow River in the south. When the chinook winds come the snow disappears. At Jasper House, at the headwaters of the Athabasca, within the mountains, the snow seldom lies on the ground a day at all. There is a fall of snow and there comes a chinook wind and it all goes off. It has the same effect at the Rocky Mountain coast.

By Honorable Mr. Turner :

Q. From what direction does it come? A. From the south.

Q. Always? A. Yes, over the mountains. At the headwaters of all these rivers the winter is much milder than at Edmonton, and at Kootenay Plains there is very little winter.

By Honorable Mr. Turner :

Q. As you go east to Winnipeg it gets colder again? A. Yes; but up at the mountains where they have those cattle ranches the snow lies a very short time. Sometimes they are caught with a heavy fall of snow in October, but that all goes away again as a rule. As a rule the climate is much milder up at the mountains than east of the mountains a piece.

Q. What point would you take as being affected by the chinook winds? A. At the base of the mountains all along from Jasper House down. At Bow River you get the cattle ranches.

Q. Where would you draw the dividing line between Calgary and Winnipeg as showing the change, getting colder as you go to the eastward? A. Say, I suppose, from Edmonton going eastward.

Q. Starting from Calgary and going down to Winnipeg, where would it be? A. I have not been that way.

Q. Well take Edmonton. From Edmonton to Winnipeg where would you say the dividing line would be between the warm current of the westward and the country which is not affected by it? A. It would not affect Edmonton much or any point below that going east towards Winnipeg. For instance, going down the Saskatchewan River, this chinook wind would not affect them at Fort Pitt or Carleton, or anywhere east. You must remember that Edmonton is a considerable distance from the foot of the Rocky Mountains—some 300 miles. Edmonton is about the last point that would be affected by the chinook winds.

The Committee adjourned until 4.30 p.m.

Hon. Mr. CHRISTIE re-appears and his examination is continued as follows:—

By the Chairman:

Q. Following up the question of the 2nd series, we would like to have your reply to the 77th. Has the natural pitch of the Athabasca River any prospective value? A. No; it is valuable to the company who use it, but they are the only persons to whom it is valuable. It saves them the cost of transporting pitch and tar into that country for their boats, and they use it for that purpose.

Q. Is the deposit extensive? A. It is very deep. It is in springs in the sides of the banks of the river. The bank at that point is not very high. A few pine trees grow at the top of the bank, and there are one or two springs there. They boil up there in the summer. You can put a long pole down, ten or twelve feet long, and you cannot find bottom. The pitch is black and very adhesive. It is like English pitch, but it has no smell of tar. They use it at Fort McMurray to cover some of the houses, and it looks like an asphalt pavement.

Q. Have you seen specimens of asphaltum there? A. No.

Q. Have you seen specimens of crude oil that comes from wells? A. No, I have never seen it, but the general opinion is that this petroleum, or coal oil, would be found there. In fact there is a report that there are some springs of it near Edmonton. The Indians report that it exists in that country, but being superstitious they would not show where it would be found.

Q. One of the witnesses says that it is found on the Athabasca River? A. I do not know. I know there is supposed to be some on the Pembina River that falls into the Athabasca River.

Q. Do you think that this deposit is very large? A. Yes, I should think so. I should think the supply of it is unlimited. It boils up out of the ground and the company have been using it for a long time.

Q. Is it on a part of the river where you could bring a boat closely? A. Yes, it is close to the Athabasca River. There is no bank there; it is a gravelly beach sloping up to some pine trees.

Q. How far is that from the Athabasca Landing? A. It is far down from that.

Q. I mentioned the Landing because it is the present point of starting from Edmonton? A. You would be nearly 300 miles from it at the Athabasca Landing. The Athabasca Landing is only 90 miles from Edmonton, and then I think they gave the distance from the Landing to the head of the Long Rapids as 200 miles, and there is 90 miles of rapids down to Fort McMurray.

Q. For what other purpose do they use this material? A. For pitching the boats.

Q. In a straight line would it be any nearer by rail, say to any part of Saskatchewan River? A. No, I do not think so.

Q. It would seem on the map to be nearer Carleton and Prince Albert especially, in a straight line? A. You would have an up-stream in any case.

Q. How far from this deposit is the largest deposit of salt? A. It is far down. It is down the Athabasca River and across the lake to Fort Chippewyan and then down the river. It is on the Salt River.

Q. What is the distance in a straight line from the springs to Prince Albert. The question is how to economize this to bring it out of the country? A. If you could overcome that break in the navigation of the Athabasca River it would be the best way.

Q. Then you would have 290 miles of water and 90 miles of land transportation to take it to Edmonton? A. Yes.

Q. That salt I understand you to say, is pure? A. Yes, perfectly pure. Instead of having to take salt in they find it there, and it is the same way with the tar.

Q. The next question is, should petroleum be discovered in large quantities by boring wells, what would be the best way to bring it from the Athabasca region to market? A. That would be by steamboat, and the route that is adopted at present.

Q. The next question is to try to elicit information as to the cost of taking in machinery to sink wells? A. I could not answer that question.

By Honorable Mr. Girard:

Q. Would there be any extraordinary difficulties to overcome in the transportation? A. No, I do not think it. I have no idea what sort of machinery is used in sinking these wells. It would not be so much I suppose as taking in a steamboat boiler.

Q. No, simply boring machinery? A. There would be no difficulty about that, but I have no idea what would be the cost.

Q. The next question relates to gold in the North Saskatchewan? A. They have been trying to discover gold in the North Saskatchewan for years. All the time that I was at Edmonton and ever since we had invariably a new set of miners every fall drifting from all sides to the mountain. They were bound to find the source of this gold. They would make from washing on the bars \$8 to \$10 a day, but they were not satisfied with that; they were always in hopes of discovering the source where this gold came from. They would winter there and start off, and next fall another lot of miners would come in. There were various theories about it, but they never discovered anything more than the fine gold they would wash in the beach. There were no nuggets found in the Saskatchewan during the time that I was there, and I do not believe that any have been found since, I can give no information on that point.

Q. We now come to the 82nd question, relating to the Indians of the district? A. The Indians in the Athabasca district, the Chippewyans and in the Mackenzie River district are rather a diminutive race. They have suffered much from disease. They talk a language something similar to that of the Chippewyans in the Athabasca district.

Q. Are they the tribe that is called the Slave Indians? A. I think they are further down on the Mackenzie, but the Indians of the Upper Mackenzie are a very poor set of Indians. They suffered very much from disease, the result of coming in contact with the expeditions coming up the coast. The company have sent in surgeons there and they have eradicated the disease and less of them die from it now, but as a rule the Mackenzie River Indians are a diminutive poor set of wretches.

Q. Can you give their localities and numbers? A. I could not from memory.

Q. The Committee would like to hear anything you have to say on that subject, because addressing the Indian Department on the subject we learn from them that they have no records on the subject, they have only a sort of estimate made by Bishop Bompas in 1880? A. I have no copies of my journals. Of course I made full reports on my return from the Mackenzie River, but I have no copies of those reports. I handed them to the company. The Indians and tribes belonging to each post are mentioned in that, if I only had a copy. I should think that any of the missionaries in Bishop Clut's district could give you very correct information as to that. He could tell you all about the Mackenzie River Indians because he has been down to Fort Good Hope all through.

By Honorable Mr. Kaulbach:

Q. Are those Indians migratory? A. No, they belong to the fort, and they hunt around it in that part of the country.

Q. They do not change from one locality to another with the seasons? A. No, they get their supplies of ammunition, &c., from the forts and hunt in the vicinity.

By Honorable Mr. Girard:

Q. Are they pagans or Christians? A. They were pagans originally, I suppose; but they profess Christianity and get baptized.

By the Chairman:

Q. Have they suffered from small-pox up there? A. No.

Q. Have they had measles or scarlet fever amongst them? A. No; I do not think they have any of those diseases in the north.

By Honorable Mr. Girard:

Q. You say the Indians have not suffered from small-pox? A. On the Saskatchewan they have, but not in the north. They had the small-pox on the Saskatchewan in 1870 very bad. It was a terrible time until the Indians saw some whites dying from it too.

By Honorable Mr. Kaulbach:

Q. Are the Indians subject to any epidemics there? A. They were not until they came in contact with the whites. They never had measles there until some of the whites brought it with them from Fort Garry, what is called Winnipeg now.

By Honorable Mr. Girard:

Q. They have doctors to treat them when they are sick? A. Yes, they have medicine men, as they call them, among themselves. The Company generally have a doctor in the Mackenzie River district. They have a surgeon at York and another at Moose.

Q. These doctors are provided by the company? A. Yes. From the absence of my journals, of which I have not copies, I cannot give you information on this point.

Q. What is the cause and nature of the disease which periodically kills off the rabbit? A. That is a disease with which I am acquainted, but I do not know how it originates. It is very curious that the rabbits begin increasing and go on until they become in the course of 7 years very numerous indeed. Then a sort of epidemic—I cannot tell you what it is, but it is a swelling in the throat, and there seems to be a sort of insect that grows into their skin—attacks them and they die off in hundreds. Sometimes we have very few rabbits and no lynxes at all. Then the rabbits begin to increase and seem to come from the south. They are followed by the lynx and both increase until this disease comes and the rabbits die off in thousands and the lynxes decrease with them.

By Honorable Mr. Dickey:

Q. If you can discover the means of propagating that disease you can get £25,000, from the Australian Government? A. Yes, but it is not desirable in the North-West, because the rabbits supply food for the Indians largely.

By the Chairman:

Q. Then you consider the rabbit a benefit to the country and not a detriment? A. It is a benefit, because it is an article of food and it does not increase to such an extent as to become a pest. There is no danger of the numbers becoming excessive because they are killed off. They increase for seven years until they become very numerous and last a couple of years and then disappear.

Q. During the years of plenty the Indians do not suffer for want of food? A. No, not so much, because they have plenty of rabbits.

By Honorable Mr. Dickey:

Q. Perhaps that disease which attacks the hare would not affect the English rabbit that has been introduced into Australia? A. I suppose the English rabbits that were introduced into Australia were very much the same as we have in the North-West. The white hare is only in the Arctic region in the winter, and is three times the size of the rabbit. There is a rabbit in the plains that is large, but the Arctic hare is a different species altogether. He is exactly like the hare at home; in summer he changes his color from white to grey.

Q. Do those rabbits in the Mackenzie country burrow? A. There are very few in the Mackenzie River country—only chance ones.

Q. They are hares? A. No, rabbits. The hare is on the Arctic coast.

By the Chairman :

Q. What effect would the opening up of the Mackenzie Basin to civilized men have upon the Indians of the region? A. I suppose it would have a similar effect to that which it has had in all other parts of the country. When the Indian comes in contact with the white man he suffers. He seems to take readily to the vices of the white man without copying his good traits of character, and becomes lazy and idle. If an Indian can get food with very little exertion he will not work. In the old times, if they had received better prices for their furs than they got they would not have been a bit better off. The Indians are not so well off on the plains now as they were in their savage state. Of course they had plenty of buffalo then, and the buffalo furnished them with all they could eat and wear. They followed the buffalo the whole year round. In the summer they made their tents from the buffalo hide, and their clothing and everything; the buffalo meat was his food, and what he did not want for his own use he took to the forts and sold for any necessities that he wanted, such as blankets, cloth, knives, &c. Of course, civilized men must eventually come in contact with those Indians; you cannot resist the tide of emigration.

Q. I suppose they are not in large enough numbers to make themselves an important consideration? A. No, in the wooded country altogether the Indians are few; the population is sparse. You never come upon a large number of them together. They are found more in families as a rule. The wood Indians are more industrious than the plain Indians. They have to work more: there is a good deal more labor in fishing under the ice than trapping fine furs in the woods.

Q. Could their labor be employed with advantage and would it tend to civilize and make them self-supporting? A. The Indians were employed a great deal by the Hudson Bay Company in transportation and in boats as voyageurs, but as steam is introduced they will not be required for that.

Q. They will lose that employment? A. Their labor was becoming very difficult to be got. In fact the company could not get as many as they wanted. You could not get white people to go in there years ago as long as they could get employment in the civilized world. These Indians are different from the Indians of British Columbia. The Indians I saw at Fort Simpson—I met two or three boats' crews at Fort Providence going in—are the most miserable creatures I have ever seen. Most of them are eaten up with scrofula.

By Honorable Mr. Kaulbach :

Q. You can never make those Indians self-reliant; I suppose civilization does not have that tendency? A. No.

By Honorable Mr. Girard :

Q. Are they better or worse when they become civilized? Has religion any effect on them? Does it improve them? A. Some it may possibly improve, but others it makes worse.

By Honorable Mr. Kaulbach :

Q. Have they the capacity to understand the importance of religion? A. They may profess religion, but I do not think they are much improved. As a rule where all these fishing posts are the Indians live entirely on fish. For instance at Norway House, they are all scrofulous there; the scrofula seems to be engendered by living altogether on fish diet without vegetables. At Norway House a mission has been established for a long time, and they have not advanced much. They have degenerated so much by scrofula and consumption that they die off. They are very susceptible to contracting colds and coughing.

Q. Supposing an attempt were made to economize those deposits of pitch on the Mackenzie River, could not the labor of the Indians be utilized in transporting the pitch or working it? A. Of course you could get Indian labor for a trifle always, but I do not know that you could depend upon it. Any company would prefer white men,

Q. Are we to understand in considering the possible future of that country, that they are not very much to be taken into account, except from a moral or religious point of view? A. In the Athabasca and Mackenzie River districts, as I have told you, there is no land adapted for agriculture or raising crops to any extent at all. When you leave the Peace River you get down to the Athabasca, a rocky, sterile and barren country, and to Slave Lake, and there is nothing there.

Q. Those Indians I suppose have no physical strength—they are weak. A. Exactly. There is no land there; the timber is stunted pine trees, and the country is covered with moss. There is no country to raise crops in after you leave the Peace River, nor any quantity of hay to be got anywhere to raise cattle. I think the Mackenzie River, for the purpose of settlers going in there, is of no use at all, unless, of course, gold or something of that kind was discovered in the mountains up the Liard, or other rivers, close up to the mountains.

By the Chairman :

Q. There is a note at the bottom of the list of questions to which I would like to call your attention, asking for additional information that you can get from perusal of your books and memoranda? A. The only further information I could give you was to name any particular districts of country that I could bring under your notice for settlement. There are large tracts of country that you do not know anything about where the soil and climate are good.

Q. A former witness, speaking of the wood buffalo, elicited a good deal of comment from the newspapers. Among others the *Empire* of Toronto took it up and suggested their views in regard to it, mentioning that it would be important to ascertain more definite information in regard to this animal. Is the wood buffalo as hardy as the plain buffalo? A. That is a difficult question to answer. He is living in a much more severe climate. The cold is greater, but he has the greater density of woods to shelter him, which the plain buffalo has not. The plain buffalo used in winter to go up to the foot of the mountains and they used to extend up to Carleton on the plains. All that country used to be teeming with them.

Q. Is it your opinion that the wood buffalo could be crossed with the domestic animal? That has been the case with the plain buffalo: do you see any reason why it should not be done? A. I do not know: that was tried away as far back as 1842. The Hudson Bay Co. had at Fort Edmonton a herd of buffalo. They began by taking some calves, and from these the herd increased until they had some thirty altogether. These used to herd out with the other cattle and come in with them. All at once the buffalo came near Edmonton and this herd went off with the others. It was the impression then, from their mixing with the other cattle, that they would not cross, because there were not any signs of it, and I was not aware that they would until I saw that it had proved successful with Bedson's herd.

By Honorable Mr. Kaulbach :

Q. I understood you to say that the wood buffalo is larger than the buffalo of the plains? A. Yes, but very much the same.

Q. Is not the fur thicker? A. Yes, they say the hair is longer and thicker from being in the woods, and they grow larger, I suppose from the fact that they do not roam about so much and have time to develop, whereas the buffalo of the plain was for ever on the gallop.

Q. Is the robe of the wood buffalo as good or is it better than the robe of the prairie buffalo? A. I should say it would be thicker.

Q. And larger too? A. Yes, somewhere between the buffalo and the musk ox. The musk ox robe is much heavier and thicker and adapted to the cold climate he has to live in.

By the Chairman :

Q. It would be interesting to know whether steps are taken to preserve these animals, and if so how they could be preserved so as to allow their numbers to be increased? A. It would be very difficult to stop the Indians of the Athabasca from hunting these buffalo. When an Indian sees a buffalo the only law for him is to shoot and eat it. It would be hard to explain to him that he must not shoot it in

the close season. The only way to preserve it from being extinct altogether would be to try and secure a few calves. They might be got there by some Indians of the Salt Plains at those springs that I have told you of, because the animals come there in the summer to lick the salt.

By Honorable Mr. Kaulbach :

Q. Is the salt produced by evaporation ? A. The plains where the springs are I fancy are not very large. The springs are situated in the plain. They throw up the water and it falls and evaporates.

Q. And the evaporation makes the salt ? A. Yes, I suppose so; it is found there quite white.

By the Chairman :

Q. The article in the *Empire* to which I have referred, suggests, if it would be at all possible, that the Government should reserve a part in some part of that country; I only mention it incidentally in case you should have any suggestion to make ? A. No, I have none.

Q. The country in which they roam I suppose is a country of agricultural possibilities ? A. No, I do not think it. I think it is very thickly wooded in the valley of the Salt River. It is not in the Peace River country.

Q. Would the reservation of a considerable section there interfere with the interest of immigrants going in there ? A. No, it will be many a day before emigrants go there. There is nothing to induce them to go.

Q. It is too far from the Peace River, I suppose ? A. There is no land fit for agriculture there. In the Peace River country it is different of course.

By Honorable Mr. Kaulbach :

Q. Much of the land that is covered with forest, would, I suppose be good for agriculture if the forests were cleared ? A. I do not know. It would depend upon the soil. A great many of the wooden parts of the country have been destroyed by fires.

By the Chairman :

Q. You gave a very interesting description of the food of the musk ox and the reindeer; look at the specimens on the table and say which of these is the food of the reindeer ? A. The *cetraria cuculata* forms the food of the reindeer in the summer, and the *cetraria nivalis* in winter.

Professor MACOUN—Sir John Franklin mentions these as being very abundant on the Coppermine, and they were the food of the musk ox and the reindeer.

By the Chairman :

Q. The least information that any of the Departments seem to have as indicated by the maps, and that any witness before us has given, is the extent of the barren grounds. Now, I understand you to define their extent, roughly speaking, as being between the head of Reindeer Lake and the Hudson Bay, between the head of Athabasca Lake and Hudson Bay, and between the head of Great Slave Lake and the Hudson Bay and the Arctic Ocean—from the heads of these lakes to the sea-coast ? A. Yes, when you leave the woods you come to the barren grounds. It is like the plain when you leave the fertile belt and come to the vast country with no woods or anything—the prairies that were the home of the buffalo. The barren grounds are the same; when you leave the last woods you get to the barren grounds, and they take you down to the sea.

Q. The Committee would be safe in assuming that the country I have mentioned between the heads of these four lakes and the Hudson Bay coast and the Arctic Ocean, are utterly worthless except for minerals that may be in them, and feeding ground of animals ranging on them ? A. I have never heard of any minerals being found in them. These barren grounds are the habitation of the reindeer in the summer and some wolves and the musk ox, but the musk ox keeps very much down at the sea coast.

Q. You mentioned that they do not seem to seek the shelter of the woods ? A. No. For this reason, you will find them at all seasons on the sea coast. For instance, at Seal River along the Hudson Bay, they have been found in the winter as

I have been told by the Esquimaux, sometimes they shoot them. You find them on the barren grounds and along the sea coast in the winter, so you may infer from that that they do not go to the woods. They may go, but the fact that they are found there in winter seems to indicate that they are very hardy.

By Honorable Mr. Kaulbach:

Q. Are the musk oxen very plentiful? A. They are very scarce. I was four years at Fort Churchill, and was asked by a friend to get a musk ox robe for him, and I was two or three years looking for it before I could get it. It is not the skin of the older animals that is most valuable; it is the skin of the musk ox when two or three years old. The skin of a large animal would be very thick and would make the robe too clumsy, but the skin of the young animal is more pliable and makes a better robe. They are very difficult to be got now.

Q. Then they are decreasing? A. No, the Esquimaux do not kill many of them. They are not an article of trade, that is to say, we do not get many of them. I only know of two posts where they trade them. They do not trade them as a rule, but we get one now and then.

By the Chairman:

Q. Is it because they are too difficult to get? A. They are away near the sea coast.

The Committee adjourned until Monday morning at 11 o'clock.

COMMITTEE ROOM, No. 17,

OTTAWA, Monday, 16th April, 1888.

The following letters were read:—

"AUBURN," PETERBORO', 11th April, 1888.

Honorable JOHN SCHULTZ, Ottawa.

MY DEAR SIR,—I am in receipt of your favor of the 9th inst., and regret to say that I have no personal knowledge of that section of country on which your Committee desire information, having never been further west and north than Lesser Slave Lake. My knowledge of Hudson Bay is confined almost entirely to the east coast, where I passed many years of my life.

I regret exceedingly that I can be of no service to you in this matter; had it been otherwise it would have given me much pleasure to have appeared before your Committee.

I remain, my dear sir, yours very truly,

ROBT. HAMILTON.

INDIAN DEPARTMENT, OTTAWA, 13th April, 1888.

DEAR SIR,—I have received papers containing a request to fill them in with any information I can give relative to the Mackenzie Basin. I beg to say that I have not been any further north than Lac la Biche. Having visited every Indian reserve in the territories and every post where there are Indians dwelling, I have probably seen more of the country than any other one man; but there is so much sameness in it—being all equally good—that I do not think I could give you any new information.

I remain very truly yours,

T. P. WADSWORTH.

Hon. SENATOR SCHULTZ, The Senate,
Ottawa.

EXPERIMENTAL FARM, OTTAWA, 13th April, 1888.

DEAR DR. SCHULTZ,—Yours, including list of names and localities selected for the distribution of Northern Russian cereals, is received, and I think that the selection is a most judicious one, covering as it does a very large area of country. I have compared it with our lists and find that we have sent Ladoga wheat to Lesser Slave Lake, and also to Lac la Biche, one sample bag to each point. As these are two important districts a second sample will be very useful and I would suggest that you leave the list unaltered. I shall be very much pleased to receive in time the results of the testing of these samples at those distant northern points in the territories, and trust that these hardy and early ripening varieties will be found of much use to the settlers there, and naturally serve as a material aid in the settlement of the country.

Yours very sincerely,

WM. SAUNDERS.

P. S.—After you have had the samples mailed, if you will kindly send me the names and addresses, I will have circulars sent to the parties instructing them in regard to the returns desired.—WM. S.

SENATE COMMITTEE ROOM,
OTTAWA, 16th April, 1888.

Prof. SAUNDERS,
Central Experimental Farm, Ottawa.

DEAR PROF. SAUNDERS,—Some difficulty has been found in our being able to forward to the destinations where we have determined to send the sample of grain, owing to the fact that they are all beyond the limit of postal facilities. After, however, consulting the Hon. the Postmaster General, His Honor Lieut.-Governor Dewdney, and the Hon. Wm. Christie, formerly and for many years in charge of the Mackenzie River District for the Hudson Bay Company, we have arranged for the safe carriage of part of these, through the courtesy of Joseph Wrigley, Esq. They are accompanied by the annexed letter with list of parties to whom samples are sent, which I send to you for your information, and to enable you to send to them at once in care of Joseph Wrigley, Esq., Chief Commissioner, Hon. Hudson Bay Company, Winnipeg, Manitoba, the circulars, &c., giving the necessary instructions.

I have sent back to the Department of Agriculture, addressed to you, the samples not used.

I am, dear Prof. Saunders, yours very truly,
JOHN SCHULTZ, *Chairman*.

SENATE COMMITTEE ROOM,
OTTAWA, 14th April, 1888.

JOSEPH WRIGLEY, Esq.,
Chief Commissioner Hon. Hudson Bay Co.,
Winnipeg, Man.

SIR,—I am instructed by the Select Committee appointed by the Senate to report upon the resources of the Great Mackenzie Basin, to ask you to be good enough to forward the seeds named to the parties mentioned upon the enclosed list, with a request that the gentleman in charge of the post mentioned will make experiment as regards the growing of these grains and report to you, or should you prefer, directly to the Department of Agriculture, Ottawa. In case you deem it advisable to direct the returns to yourself, the Committee earnestly request that you will forward these or a copy of them, without delay to the Department of Agriculture here. The samples are put up in small bags with labels, and your re-addressing

them to Dominion Post Office nearest to your private line of communication with the districts mentioned, will avail for their free carriage through the mail.

The Committee regret to have to trouble you in the matter, but they will all the more appreciate your kindness if you feel that you can comply with their request.

I have the honor to be, sir, your obedient servant,

JAS. DRYDEN, *Secretary.*

P.S.—Prof. Saunders, of the Experimental Farm, will address in your care certain circulars regarding the planting of the seeds, &c., which kindly allow to go forward with the seeds themselves.

J. D.

<i>Names of Seeds.</i>	<i>Parties to whom addressed.</i>
Oneqa spring wheat.	Officers of the Hudson Bay Co. in charge of the following forts: Fort McMurray. Fort Yukon. Isle à la Crosse. Fort Liard. Fort Reliance. Fort Good Hope. Fort Rea. Fort Smith. Fort Simpson. Fort Norman. Fort Chippewyan. Fort Providence. Peel's River. His Lordship Bishop Bompas, Mackenzie River Dist. His Lordship Bishop Farand, Isle à la Crosse. Rev. Father representing His Lordship Bishop Clut, Mackenzie River District.
Petchora barley.	
Polar winter rye.	
Saxonka wheat.	
Ladoga spring wheat.	
Oneqa oats.	
Polar barley.	

(See Mr. Wrigley's answer to above.)

MALCOLM McLEOD, Esq., Q.C., ex-Judge, called and examined.

By the Chairman :

Q. Are you prepared to furnish any information in reply to the list of questions sent to you? A. I find that I am not in a position to answer some of them categorically, but I have embodied what information I can give in a written statement, which is as follows:—

The call of your honorable Committee on me is, as I understand, to give any information, authentic or reliable, that I may possess, as to the general economic resources of the region or regions above referred to. It is a theme on which I have largely written in the public press, and have earnestly pressed on the attention of Imperial and Provincial Governments for many years before our Confederation, and also since, from a sense of the fact, that few, and as to certain important facts, no one else, then alive, had the knowledge, viz., feasibility of a railway route across British Columbia then desired. On this point, I would—not in boast, but by way of credential—give the testimony of such authorities (the very highest on the subject) as the late Sir James Douglas, the first Governor of British Columbia, whose service in the regions in question as an officer in the fur trade, and latterly on the Pacific slope, under the British Crown, extended over half a century; also the certificates of Mr. Sandford Fleming in relation to the initiation of the transcontinental railway with which he was charged; and of Mr. Alexander Morris, first Lieutenant Governor of the North-West Territories; these, with other papers, from responsible

authorities and other documentary evidence bearing on the subject of the present enquiry—are respectfully laid before your honorable Committee.

The bulk of the papers presented in evidence are, as they show in themselves, rather old, and some, such as my father's journal of the initiation of the Selkirk Settlement and of the fur trade of the Hudson Bay Company in the Red River Region and westward and northward to the Mackenzie Basin—in all which he took a leading part, dating back as far as 1811. From that time till his death in 1849, when still in active service, he was in constant and familiar correspondence with his associates in the fur trade from all quarters of the vast territory covered by their enterprise. Some of these letters, moreover, were from Arctic explorers, Franklin, Back, Simpson, and amongst them, scarcely less in importance, his namesake, chief trader John McLeod, jun., the discoverer and first explorer of that "land of milk and honey," as his immediate follower called it between the Mackenzie and Alaska. All these letters touched on the then and there vital matter of local food resources. What was said on the subject was in utmost truth, in fullest and familiar confidence. Such evidence is beyond cavil.

As to personal knowledge, I have only the memory of what I saw and experienced in early life; for I left the country, permanently, at nine years of age. I remember the general features of part of the regions in question, viz., from the Athabasca Pass—highest source of the Mackenzie River—to Hudson Bay, at York Factory.

I have a distinct recollection of the general physical features of the country from the Rocky Mountains to the Bay. From the summit to Norway House, at the head of Lake Winnipeg (lat. 54° N., long. 98° 10' W.) my impressions are only those of a traveller, and at this distant time (after sixty years) are not sufficiently clear and continuous to enable me to speak with any pretension to authority, but of the region about Norway House, and thence to York Factory (lat. 57° 01' N., long. 92° 36' W.) I have a clear and perfect recollection.

At Norway House, I lived with my father four years, viz., from 1826 to 1830. Thence *via* York Factory, with father and younger brother, took ship for England. I have never returned to the territories; but to this day have ever been in familiar correspondence with friends and relatives settled there at different points; many of them, especially the Pruden family, children and descendants of my maternal grandfather, the late Chief Factor John Peter Pruden, who, like my father, was one of the original chief traders and partners of the coalition of the two great rival free trade companies in the north in those days. That was in 1821. I produce for view, by way of credential, my father's copy of the deed of partnership. I produce also, on the same score, his manuscript journal of his life in service in the country from York Factory to near the foot of the Rocky Mountains, throughout all the Red River country, and thence northward to Methy Portage on the highway, and sole route of the trade to the further north and north-west. Methy Portage, or "Portage la Loche" as the French called it, being the "divide" between the Beaver or Churchill River Basin and that of the Mackenzie. He (my father) built, before the coalition, every Hudson Bay Company's trading post, except the old Norway House, between York Factory and the furthest west on the line of the Red River, and in the north from Isle à la Crosse to Methy Portage—work all done under circumstances to make that then vast bloody field of battle their historic ground, to his family at least. After the coalition, in 1826-27, he rebuilt Norway House after its destruction by fire. I say this much to show that though not personally present in a great part of extended field of enquiry, I am in a position to know of it and its resources for sustenance of the life of man, even under most adverse circumstances. On this point I shall speak more fully hereafter in deductive evidence from certain facts incidental to my father's life in that field.

From Athabasca Pass to Edmonton.—Climatological Relation to Mackenzie Basin.

This pass—the highest in the Rocky Mountain range—is in latitude 52° 13' N., longitude 118° 12' W. It is, as measured and reported in survey for our Pacific

Railway, 6,025 feet in height above the sea. By the rule in climatology, which allows one degree of latitude for three hundred feet of altitude, this corresponds with latitude $72^{\circ} 18' N.$ on the meridian. The latitude of Point Barrow, the most northern part of this continent, the mainland as given by Simpson, of the Dease and Simpson Arctic expedition, is $71^{\circ} 23' 33'' N.$, longitude $155^{\circ} 20' W.$ The latitude of the mouth of the Mackenzie (Tent Island) is, as given by Franklin and Simpson, latitude $68^{\circ} 49' 23''$ longitude $136^{\circ} 36' 45'' W.$

I knew Simpson personally, and his letter from Fort Confidence to my father (amongst the papers produced) kindly refers to myself and brother—then boys—his former playfellows. The book I cite his determination from, I got from his partner in Arctic work, viz., Chief Factor Peter Warren Dease, with his autograph on it—his only copy, he said. In frequent familiar intercourse with Mr. Dease, I learnt much of that far north, where for many years he was a chief officer in charge, and in the course of which he was of material assistance to the later Franklin expedition, viz., that of 1825–26–27, and the year following was my father's guest at Norway House. But to proceed:—

I give these determinations of height and relative latitude to indicate from my own personal observations on the slope (eastern) of the Rocky Mountains what might be the flora of the Mackenzie valley in corresponding relative latitudes. At the summit of the pass there is a pond, called in the maps, the Committee's Punch Bowl, i.e., Committee or Board of Directors of the Hudson Bay Company in London. It is rich in fertile mud. I was nearly drowned in it when passing through it on horseback. Trees from 30 to 40 feet in height grow about it. At that height the growth is abnormally great, and is to be accounted for by the fact that the Pass is between two sheltering heights, Mounts Hooker and Brown, both over 10,000 feet above the pass, while the approach to the pass from the west is of a character to gather in the warm winds of the Pacific, as a sort of gateway, funnel shaped, for the ever warm, so called, "chinook" winds.

From the summit of the pass to what my father's journal calls its east end, say Jasper House, is a fall of about 2,782 feet. The journal entry as to the passage is "April 27th. Arrived at Boat Encampment," (west end of the pass) "about noon." This was the end of our boat voyage from tide water at the mouth of the Columbia, up stream a thousand miles, at least four hundred of which traversing the Selkirk Range by its canons, was between walls of snow and ice from 6 to 10 feet in depth, and at the end of our navigation, with the towering mountains over three miles in perpendicular height before us, it rapidly increased, till at the summit of the pass, as we knew by the tops of the trees whereon we camped—*sub cælo*—it was, at least, thirty feet in depth. That season the snow was unprecedently heavy, so the journal says. Cutting our leather trousers into snowshoes—bear's paws, as they were called—we started next day, after midday (28th April). "On 5th May arrived on the east side," distance about 80 miles. The feat was performed without accident to life or limb, though hundreds of times we had, with much peril, to cross by wading the ice cold mountain torrent—our only possible road in the ascent, and at one place (Le Grande Cote) where for about a thousand feet in height the slope of the shoulder of the mountain (Hooker) was, in after years, measured by Civil Engineer Moberly (W.) at an average of 75 degrees, 30 degrees more than that of the "Mauvais Pas de Chamounix." Eschewing details, suffice it for the present purpose to say—that arrived at Jasper House on the 6th of May, we found the snow all gone there, and the horses awaiting us grazing their fill on the young grass. As to this, Mr. Drummond, one of the botanists attached to the Franklin Arctic Expedition of 1825–7 in page 311 of the journal of the expedition, says: "On the 6th of May the Columbia Brigade" (that was ours) "arrived." "At this time," says the journal, "*Anemone, Cuneiflora, Ludoviciana, and Saxifraga oppositifolia* began to flower in favorable situations." These plants, as I understand, are indigenous, and common to Quebec and Ontario, and, I believe, in the more eastern provinces, where wheat grows, as well as elsewhere.

The altitude of Jasper House—situated near the Yellow Head Pass, is, as given by the repeated measurements in railway survey, about 3,243 feet above the sea. The situation is a somewhat exposed one. The latitude and longitude of the place, from Hudson Bay Company's charts, I estimate at $58^{\circ} 40'$ north and 117° west respectively. The height in general climate should correspond with that of the latitude of Fort Simpson on the Mackenzie, viz.: latitude about 62° north, longitude $121^{\circ} 30'$ west, and which, as estimated by Franklin and Richardson, is only about 450 feet, or less, above the sea. Fort Liard (above it, towards the mountains) being, by Richardson, laid at about only 500 feet above the sea. From these facts I hold that the flora and its development, in season, at and about the Jasper House region, and that about Fort Simpson and Des Liards (*Anglicæ* of the poplars—black poplars, with very glossy leaves) is the same, or nearly so. As to the flora of Jasper House, the celebrated botanist Drummond, and our own equally reliable expert in that line of science, Professor Macoun, has given us incontestable, and most satisfactory records, to the effect, that from *Flox Drummondii*, to probably wheat and even to more tender flora we have, there, and thereabout, abounding agricultural and pastoral resources.

As to Mr. Drummond I have a word to offer in explanation. On our arrival at Jasper House we found him there; the welcome guest of my mother and of a Mrs. Ross—wife of Mr. Alexander Ross, a retired officer of the late North-West Company, subsequently many years after sheriff at Red River Settlement, author of a very able history of a settlement, in which I perceive he refers to the incident (this occasion) of his family having wintered on the height. The fact was, as women and children (save myself) could not "travel the pass" in the spring by reason of the snow of which there was always more or less at the summit—the two mothers with their young children—five, between the ages of ten and three—had tried the fall trip, in October, when the water was low, and the pass was feasible with horses. They were, however, overtaken by unusually early and heavy snow, and had to take refuge in Jasper House, a mere shell, never permanently occupied, but used only for temporary trade with the Indians about there in summer, the nearest regular trade post or habitation was Edmonton, about 250 miles distant. Chief Factor McMillan, a gentleman of immense physical power—reputed the strongest man of the North-West, courageous and of most kindly feeling, was in charge of the party. He left, with the helpless ones, a man to collect wood for them, and hunt for food, for they had only provisions of the way. Soon as he could, in toboggans, he returned with provisions for them for the rest of the winter. In the meantime, the hunter having done his duty in the way of supplying wood and food, deer, &c., had gone off. McMillan, on arriving, found "The Little House," as it was termed, completely buried with snow, with even the chimney out of sight; and no smoke or vestige of habitation. "They are all dead!" was his first impression, and his "heart," as he says in his pathetic letter, "sank within him in pity and despair."

McMillan, a brave man in the highest sense, was of tenderest soul. At last they found the chimney hole. Shouting into the dark grave-like hollow: "Are you alive?" at once came the glad answer "Yes!" All well! Truly, Providence had tempered the tempest to the tender ones. There in the snow drift my mother gave birth to a girl, a strong mountain child of the north, now living with me and of health and strength that speaks well for such nursing.

On the 7th May—leaving Mr. Drummond at his work of botanical collection, we started for Edmonton, taking the upper trail, as the lower and shorter one, through wood and swamp, was too wet. On the way, especially at and about McLeod's River, a branch of the Athabasca, altitude, say, 2,500 feet above sea. I remember distinctly the beautiful parklike country, with its fringes of wood along the streams, and the prairies not green yet, but with the light winter brown of last year's dead grass, or rather seared grass, for, as food, it—unlike our grass when dead—is relished by horses, buffalo and cattle. On 17th May arrived at Edmonton; all safe. Then the brigade of boats started from Rocky Mountain House, 140 miles above Edmonton; on the Saskatchewan, were on the way, for the general rendezvous at Norway

House, whence, by a re-arrangement of brigades of boats, cargoes were transported to York Factory, for shipping thence, early in September, to England. The food for all this brigade work was the pemmican of the country, collected and made up chiefly—almost wholly—at Fort Carleton, the emporium of the prairie country, built by my maternal grandfather, Chief Factor Pruden, in 1797, and kept by him, with but little intermission for about forty years. Carleton was, moreover, the gateway to the north, and all Arctic and other expeditions in that direction had to pass through it. All the reports of these expeditions and also of pleasure travellers in that quarter speak of it, and always with a special reference to the food capacities, &c., of the place and region all around. I was born at Green Lake, 236 miles (geographical) north of it. On this meridian the forest begins at lat. $53^{\circ} 30'$. I cite from Simpson. It continues to the northern rim of the basin of Great Bear Lake, where it has been found suitable for house and boat building as proved at Fort Confidence, where one of these letters (number 14 in the packet) was written by Simpson to my father. As to the wood of that far north I would observe, that it is remarkably hard. I have a pair of snow shoes of peculiar shape, made right and left of birch for frame, like iron in texture, and though about perhaps a hundred years old, perfectly sound. As to the other limits of that forest, I can say from personal knowledge, they are as follows, within (i. e. south of) lat. $57^{\circ} 30'$. On the west, the Pacific, where on the Columbia my then fellow traveller the celebrated botanist David Douglas, in my presence, measured one of his giants, a Douglas Pine lying by the shore, and found it fourteen feet in diameter. On the east by the alluvial shore of Hudson Bay where almost to the very margin it is of sufficient size for house or even ship building; and where, I would add, there is an inexhaustible field for a timber trade, in which line of investment (in England and Norway) my father with other Hudson Bay Company proprietary were for some years profitably engaged. At Norway House the resin pine, spruce, birch and other northern kinds run up to two feet in diameter; and at Rock Portage (about 140 miles from the bay) exceed half that. Rock Portage or Rock House, so called from a huge rock blocking navigation there, used to be a depot at the head of comparatively easy navigation from York Factory. I there saw the remains of a fine large garden, all run wild, lat. $55^{\circ} 45'$, long. $94^{\circ} W.$, or about that.

Food resources of the region (Sub-Arctic) between the Mackenzie Basin and the North Saskatchewan.

Under this head I do not pretend to advance anything from personal knowledge. But the subject has ever been one of familiar family-hearth talk with me and my people, and my father's recorded experience in it was a very special and extended one. To give an idea of its nature, and I may say value, in the present enquiry, I must, briefly as possible, state the facts of the case. These facts appear not only from my father's journals, &c., but also from the books, such as Franklin's journals, Hargrave's "Hudson Bay Territories," and also, I may add, in judicial records in Montreal of legal proceedings by the North-West Company against certain persons connected with the Hudson Bay Company and the Selkirk Settlement, during their troubles.

In 1815 and 1816, in resistance to the attacks of the North-West Company, the Hudson Bay Company co-operatively with the "Selkirk Settlement" drove the former out of the Red River region, capturing all their forts, even their "Gibraltar," and breaking their sole line of communication in trade with the north, and north-west and the Pacific slope. In that, in the field, my father took very active and in fact, a leading part, for often on the most critical occasions he had to act in lead on his own responsibility. Having in his four years of service in that debatable ground, prepared house and home for the new masters there, he was, in July, 1816, appointed to the charge of what was then called the English River District. This district comprised the most important and richest fur region in North America, and probably in the world. As laid out by the Hudson Bay Company for their working,

its western limit was a point about 50 miles to north-east from Edmonton, latitude, $54^{\circ} 30' N.$, longitude $113^{\circ} 13' W.$, the north-east limit in latitude 59° , longitude $112^{\circ} 30'$ —a distance in air line of 764 statute miles between these points—the northern boundary runs from the south-west point aforesaid, near Edmonton, north-east about 150 miles, along the height of land between the Beaver and Athabasca watersheds, thence to Methy Portage (east by north), thence about 600 miles to the north-east extreme aforesaid, which is about 200 miles west by north from Fort Churchill at the mouth of the Churchill River, of which the Beaver River is merely the upper part,—the southern boundary from the south-west extreme aforesaid follows the height of land between the Saskatchewan and the Beaver watersheds, in a general easterly direction, till it strikes Frog Portage, about 100 miles north by west of Cumberland House, thence crossing the Beaver or Churchill in a general direction north by east along the height of land between the great "Reindeer Lake" (or Deer Lake or Lac de Brocheta, as it is called in the Hudson Bay Company map) and the "South Indian or Big Lake" or "Split Lake" of the Churchill River system, till it meets the Laurentian height in that quarter, about 150 miles west by south from Fort Churchill. This area of the English River District I estimate at about 84,000 square miles. It is represented as a region comparatively flat, abounding with lakes of no great depth, with rivers and minor streams in all directions; rock and swamp with intervening swells of dry light land, a sandy loam, forests everywhere except in open water—waters clearest and purest—abounding with the finest edible fish in the world, viz., whitefish, trout, pike, chub, catfish (loche) all in variety, quality and facility of catch, at all times affording an inexhaustible supply of most palatable food to man and beast, along with wild or meadow hay of the country.

In this paradise of the fur trade, the earliest trading posts were established by the Canadian fur traders. It became the highway—sole highway—of their trade beyond to the Pacific *via* Peace River, and to the Arctic proper—the Mackenzie Valley. When my father was there in 1816 there were only two Hudson Bay Company trading posts in it, viz., one at Isle à la Crosse, and another at Green Lake. The North-West Company had several, with a regular line of them to Methy Portage. They commanded the route, blocking all Hudson Bay Company effort in that direction. The latter Company poured in their forces—hundreds of picked men from Scotland, England and Ireland, brave and strong, led by gentlemen also selected for such purposes to force their way to the Eldorados beyond their then *ultima thule* in that direction, viz, Cumberland House on the Saskatchewan. All was in vain. They could not cope with the Canadians, French and British—mostly Scotch, trained to the work, and standing as they said, and really felt, on the land they had won by their venture. They had not the *quasi* military force of the Selkirk Settlement, with its Woolwich ordnance and musketry to contend with. At this particular time (summer of 1816) they had mustered in overwhelming force to drive out the English, "Les Anglais," as they termed them, and who from the earliest times in the trade had drawn it thence to their Hudson Bay posts—Churchill and York Factory—hence the name English River District.

With forty recruits from Norway House my father entered the district. The force against him was as four to one. At Fort de L'Isle à la Crosse, the threshold, he fought till he had not a gun and only a dozen or so of men; luckily for him the Indians favored, as much as they dared, the new opposition. He scattered his men among them in trade. They, again, were hunted by the North-West Company men in bands. Stopped in their line of communication from Montreal, and to it by the Selkirk military force, and driven back from Red River and Assiniboine, the North-West people crowded into their stronghold, this English River District, till at last, in 1817 to 1821, there were, it was calculated, between 600 and 800 of them, and about 200 of the English, the Hudson Bay Company. During all this time, in constant fight, my father was in charge, except for some months when in Montreal under warrant for his work—"burglary," as the indictment charged—in capturing North-West ports by *coup de main*, sword in hand, as was his wont. The bill was thrown out. In returning he brought in with him the first French Canadian Brigade,

between forty and fifty, with two worthy Roman Catholic priests, Pères Provencher and Dumoulin, for the Red River Settlement, where he had won over the French Canadian freemen. This aside.

Returning by repeated appointment to the English River District he succeeded at last in establishing a line of posts to Methy Portage, erecting buildings, &c., for a horse portage—the portage, 12 or 13 miles in length, being heavy for men. That conquered, for Hudson Bay Co., the farther north; and the same season—but alas; disastrously late—saw the Blues on the Peace River; and there, ever since, they have been revelling in its plenty and goodness for life in every, or at least in many regards, and with no drawbacks, but isolation from the world of busy commerce and civilization.

In all this work and strife, with constant strain of animal energy requiring good and strengthening food, men must, and did, eat very largely—say from 5 to 7 lbs. of meat and double that of fish per day. Yet all the supply for it was always solely local. On the route for travel, something, of course had to be taken for nourishment along the wearying way, a piece of pemmican (dry, strong food, requiring oft the digestion of an ostrich) while at paddle or oar, or short breathing spell on the way. But apart from that, the custom and the specific order of the administration was, as shown by Governor Simpson's autograph letter to my father when appointed to the charge of Norway House, through which alone all food supplies and luxuries for the interior were drawn, that every place even Norway House must from its own natural resources feed its own people, whether belonging to the company or not, and as to luxuries, viz., spirits, wine, tea, &c., they were limited, and that very closely—by Order in Council.

This rule was, and I presume is still rigidly carried out throughout the vast territories in question, and I never heard that anyone was starved by it.

At Norway House, during navigation, fully a thousand people, all travellers to and fro and many of them residents for weeks waiting for their proper brigade, had to be fed, and were fed entirely out of the natural resources of the place, viz., fish (staple) and bird meat for there were no deer about the place nor large animals. For vegetables, very scarce, we had only potatoes—sent in leather bags from Cumberland House, about three hundred miles off, our next post up the Saskatchewan. There was plenty of good open ground for cultivation at Norway House, but everyone was so busy at more urgent work that no one even tried it. At Oxford House, nearly 150 miles further east and colder on the height of land—the summit of the Laurentian Range—there was a fine garden, growing potatoes abundantly, and whereof, *en passant*, I did eat. Here in 1832 forty head of cattle were kept and a large gang of men supplied from the place while making a winter road between Norway House and York Factory. At York Factory, on a shore we may call Arctic, I saw nice little gardens with turnips, radishes and flowers many and beautiful. My old friend Peter Warren Dease of Arctic fame, and whose son-in-law Bell was for many years in charge of the most northerly Mackenzie River coasts, used to tell me of his (the old gentleman's) fine and successful gardening in the far north. He had a taste in that way, as shown in his ever well trimmed and highly cultivated grounds back of the mountain of Montreal where he lived on his retirement from the service. To him, as a perfectly reliable authority, I owe much if not most of my very strong conceptions as to the singular fertility of the Mackenzie River Valley.

As to the scientific causes of the phenomenon I have in some of my notes in my book "Peace River," given my own ideas and the data and authorities on which I base the ideas; but that I am aware is not evidence, and, not, therefore, within the purview of the present enquiry. I regret not being in a position to give fuller and more positive information on the subjects of the present enquiry, but am prepared to answer any questions to the best of my ability which your honorable Committee may put to me.

By the Chairman:

Q. I note in your pamphlet on "Peace River, a canoe voyage from Hudson's Bay to the Pacific," you say in note 37: "These northern bituminous springs are reported

on from an area of over a hundred thousand square miles, between the primary rocks of the Laurentian system and the foot of the Rocky Mountains and even some distance up their slope." Now a hundred thousand square miles is a large area. Have you any reason to alter your opinion since you wrote this book or do you still adhere to that? A. None whatever. As to my statement, everything I said in that book is within my own conceptions. As a rule I made my statements after a very careful investigation. In this instance I made the measurements carefully and weighed all the facts, and when I stated that area I can safely say that it is within the mark.

Q. Are the localities correct? A. Yes. Far up the Mackenzie River this tar is found oozing out of the sardstone rock. Another point is on the Athabasca, below Clearwater River, and on Athabasca Lake it occurs again. I saw it myself on the McLeod River.

Q. You say that on the Athabasca, McLeod and Pembina Rivers, in the line of travel between Edmonton and Jasper House, coal is found in seams from 15 to 20 feet in thickness? A. I do not remember seeing it, but my father and our people always spoke of it.

Q. You say that for a distance of 350 miles coal is indicated by abundant "shows" on the Peace River in its upper reaches and extends to the Arctic ocean. Then you pass on to the lignite which you say is still more extensively developed. You give the result of Sir John Richardson's observations and inquiries on the subject in this way: "at the junction of the Mackenzie and Bear Lake River the formation is best exposed; it there consists of a series of beds, the thickest of which exceed 3 yards, separated by layers of gravel and sand, alternating with a fine grained friable sandstone, and sometimes with thick beds of clay, the interposing layer being often dark from the dissemination of bituminous matter. The coal when extracted from the bed, is massive and most generally shows the woody structure distinctly." You mentioned that all along the Mackenzie—which you state in another part of your pamphlet is about 1,300 miles—there are indications of this lignite and real coal. Has anything occurred since the publication of this pamphlet to alter your opinion? A. Nothing. On the contrary, I have had information to add to it. Of late, I find from the reference of Simpson to pitch coal on the shore of the Arctic Sea, between the mouth of the Mackenzie River and Point Barrow, that the extent of the coal deposit is even greater than I supposed.

By Honorable Mr. Macdonald (Midland):

Q. That is not the volume that was suppressed by the Hudson Bay Company? A. No, it is the journal of Dease and Simpson.

By the Chairman:

Q. On the map that accompanies your interesting pamphlet, which is taken I believe from the best authority, you have placed here; through that whole country between Isle à la Crosse and Athabasca, "salt and sulphur springs," that is bounded on the north by Lake Athabasca, on the south by the Clearwater River and the lakes of the Beaver chain, and on the west by the Great Slave River. Now please tell us what you know of the purity of the sulphur and the strength of the salt in these springs? A. I have no personal knowledge of them, not having seen them, but Simpson, of Dease & Simpson, who is a very good authority, on the salt particularly—I mean the salt on the Slave River between Great Slave Lake and Athabasca Lake—describes it as being very pure and as being used habitually by the Company.

Q. Is it in large quantities? A. Yes, it seems to be in large quantities, because the place is called the "Salt Plains," implying that there is quite an extent of them.

Q. Have you reason to believe that the sulphur is the ordinary sulphur of commerce mixed with earth? A. As to that I cannot give you an opinion. The sulphur seems to permeate the whole of the region largely, because approaching the fires near the mouth of the Mackenzie, travellers speak of sulphurous exhalations.

Q. Do you know if sulphur is found north of Great Slave Lake? A. I have no personal knowledge.

Q. There is another point; I notice in your interesting work that you describe, on the authority of Simpson, I think, the killing of wood buffalo on the Clearwater

River, which is an eastern affluent of the Athabasca. No witness heretofore has mentioned them except as being some distance west of there. Have you reason to believe that in those early days they were found as far east as Clearwater River? A. Yes. All the references of Arctic explorers—Franklin's writings and Simpson's reports—mention it. Simpson went through there in the depth of winter, and he speaks of buffalo and elk on the hills there.

Q. On the Clearwater River? A. Yes, on the Clearwater River at the head of the valley. He speaks of seeing them there in abundance.

Q. Then at another part of your work you state practically your belief that the whole country from the southern limit covered by this investigation eastward to the line of the barren grounds, westward to the Rocky Mountains and northward to near the Arctic circle, will grow the hardy cereals? A. Yes, excepting in the Arctic circle. I would not say that barley would grow there.

Q. Have I correctly defined what you mean by the eastern and western limits of growth, the eastern one being bounded by the barren grounds and the western by the Rocky Mountains? A. As to the western, the Rocky Mountains is very indefinite, this region I speak of between the Mackenzie and Alaska is over the Rocky Mountain range.

Q. I do not refer to anything west of the Rocky Mountains: I mean to the east? A. Yes, it extends over that.

Q. Can you give us the northern region of wheat culture? A. Fort Liard in general. We know for certain that at Fort Liard it is a reliable crop—reliable for four years out of five at any rate. That is the report and I believe it.

Q. Taking that as the northern point, what limit would you give for the eastern and western points? Will it grow as far east and west, south of that as barley will? A. In that latitude east it is very limited. It is rough. It will grow about 100 or 150 miles farther east than Fort Liard.

By Honorable Mr. Power:

Q. What is the meaning of Liard? A. It means poplar—a black kind of poplar.

Q. Will you tell the Committee something about the climate of the region. Your book speaks of it very much as you explained it yourself to-day—that there was undoubtedly an influence from the south-west chinook winds. How far north does that effect extend? A. It seems to affect the climate to the very Arctic circle. My explanation of it is this: these chinook winds as they are called, are from the part of the Pacific where the gulf stream of that ocean runs, and it affects the climate so much that even in the winter the average temperature of the Pacific is never below 51 or 52 degrees Fahrenheit. I am speaking of the temperature of the water on the coast of British Columbia, of course it varies considerably. The winds from the west of course carry moisture from the Pacific waters, and that moisture is absorbed by the snowy heights of the Cascades and Rocky Mountain ranges. By the time these winds reach the eastern side of the Rocky Mountains their moisture is gone, but still they have not lost all their heat; they are still warm winds. The Rocky Mountains being broken in places, for instance at the Yellow Head Pass, it is only some three thousand feet above the sea (that was why I wrote that book to show how little height there was at the Peace River Pass, because you can paddle through it); and the Passes being wide these warm winds rush through these large passes in large volumes to the east, and the effect is I may say magical at times. It is a dry and hot wind and it licks up the snow very quickly. We saw that passing through the Athabasca Pass. While the snow was 30 feet deep away above us, it had all been licked up below.

Q. Do you not think there is a little inconsistency between your theory and the fact? If the warm winds coming through this pass produce the warm weather which is found in the lower levels of the country, how is it that in the passes where these winds rush through the snow remains 30 feet deep, while below, the snow is all gone? A. At these passes the snow remains above, because of the great height of the range.

Q. But if the warmer winds passing through melt the snow in one part why do they not melt the snow in another part? A. Because they cannot. At the Athabasca Pass the mountains tower 10,000 feet high.

Q. If that is the case, the heat must be all taken out of the wind before it reaches the country east of the mountains? A. No.

By the Chairman:

Q. If I understand the witness he says that the wind licks up the light snow fall first, and then it may take away a foot and a half of the 30 or 40 feet of snow that is in the pass, and when it gets east of the Mountains again it will lick up the light snow fall there? A. Yes, that is it.

By Honorable Mr. Power:

Q. It seems to me that if the heated air from the Pacific is sufficient to melt the snow in the Peace River region all the way up to the Arctic circle, surely when it is confined in the passes it must melt all the snow there? A. It does not, because there is too much snow. East of the passes the country is lower and there is much less snow, and the winds have effect enough to keep the snow melted.

Q. I suppose you know that there is another theory as to where the wind comes from? A. We all know that it is a warm Pacific wind. It is not my own theory; it comes from authorities. The immense plains on the east side of the mountains create a volume of hot or warm air by what is called radiation. The same thing happens in other parts of the world. The same thing has been remarked in Asia, on the northern side of the Himalayas, where the snow line is from three to six thousand feet higher than on the south side. The explanation is that from the immense radiation of the northern plains a body of heat is created which has that effect. So in our great plains that principle of radiation holds, and I believe it is a most potent agent in creating that effect.

By the Chairman:

Q. What is the snow fall on the Liard River? Is it light or heavy east of the Rocky Mountains? A. I remember what the snow fall was at Kamloops—that is on the plateau between the Cascades and the Rocky Mountains. We started from there on horseback on the 19th February. Generally it is spring then: there is no snow to speak of.

Q. Is that on the line going east to the Liard River? A. The Liard River is considerably to the north-east, of course.

Q. What is the snowfall, say at Fort Liard? A. It seems, from all accounts, to be no more than we have here on the average. From my father's journal, for instance, I learn that he rode on horseback, in the dead of winter, a thousand miles over the prairies, from which I would judge that there is less of a snowfall there than here. I can safely say, therefore, that there is less snowfall at Fort Liard than in Ontario.

Q. You stated that the English River district comprises 84,000 square miles. How much of that may be called barren ground? A. None of it is in the barren grounds, as given in the maps. The limit of that is laid down in Hudson Bay Company's maps. It accords with Mr. Christie's evidence, which I heard here the other day. The boundaries of the English River district, east and on the north-east, are the barren grounds.

Q. Are there any agricultural possibilities in the English River district? A. Yes; between Fort Carleton and Green Lake, and from Isle à la Croix to the Rocky Mountains is fit for settlement, I believe—a fine beautiful country. I have relations there, uncles and cousins settled in that country for years, who have done well. To one of them, 40 years ago, I was in the habit of sending packages of seeds.

Q. You stated, when alluding to some portion of the Laurentian range, that there were gardens? A. Yes, at Oxford House, on the height of land.

Q. Are we to understand that where the Laurentian rocks occur, the land is not entirely valueless? A. Whenever there is land there it is rich.

Q. In the valleys? A. Yes, little valleys. The land is flat—I mean there are no mountain heights, but rolling lands, just such as you see from here. The Hull

Mountain is given as 1,400 feet above the sea. Between this and York Factory, Hudson Bay, there is not a single hill higher than that. I have myself been hunting up near the height of land, and I measured there for the altitude and found it to be 1,300 feet; so from my own observation I should say that country is comparatively low and rolling. In the valleys there is a little land, not fit for large farms. At Oxford House there is enough land to grow vegetables and maintain a gang of men and 40 head of cattle.

Q. The country covered by this investigation was acquired by Canada, part of it from the Hudson Bay Company, and part of it from the British Government, who had never parted with it to the Hudson Bay Company, but had given a license from time to time to them to trade in it. Now, was the \$1,500,000 which was paid to the Hudson Bay Company by Canada for the abrogation of their rights to Rupert's Land proper—that is all the country, the waters of which flow into Hudson Bay—or did they exact from Canada any part of that sum for the region west of that? A. That is a broad question and suggests a variety of things, but understanding the question to be more particularly as to whether the Hudson Bay Company, in their act of surrender, abandoned any rights that they might have had in this region beyond Rupert's Territory so-called, I have this to say: the surrender was only as to their rights in Rupert's Land. The Act distinctly says so. The Act assumes that they had no proprietary rights beyond the slope of Hudson Bay waters, and we know those limits. They surrendered all those proprietary rights. In the Act there is no reference whatever to the region beyond, for the good reason that they had no right to surrender. However, they had a kind of right beyond Rupert's Territory proper in this way: at the time of the coalition with the North-West Company they obtained a license to trade—a monopoly of the trade from the Imperial Government—of the country beyond Rupert's Land. In the license I am not sure that the term Rupert's Land appears, but it speaks of the territories of the company, and all judicial interpretations show what that means, because the question has come up frequently in our courts; but we know beyond that, from the disorganization of society (if you can speak of society in that region), that at that time it was necessary to have this license, and they obtained it. That license, like a lease, was an acknowledgment by the company that they did not claim any proprietary rights to it. That license was for 21 years.

Q. That had expired? A. Yes, but before it expired, from some internal change in the general affairs of the company, they in 1838, surrendered it and obtained a new license for 21 years. Under that license they carried on the trade as a monopoly in the territory beyond Rupert's Land.

By Honorable Mr. Macdonald (B.C.):

Q. That license applied to British Columbia? A. Yes, in terms. It was to expire in 1859. When 1859 approached things had occurred to change the position of parties and it was not renewed.

Q. The discovery of gold in British Columbia broke that down? A. Yes, but in the meantime our colonization in British Columbia had evoked from the Imperial Government the Act of 1858, creating British Columbia, giving it new boundaries, changing the boundaries, for instance, from the Rocky Mountains, to longitude 120° W., where that meridian strikes the range. The effect of that was to give a great slice of the Peace River country to British Columbia. The boundary as laid down there is longitude 120° W. and the river at the mouth of which is Fort Simpson and Liard. They had merely a license of occupation. As to whether they had any right at all over that, I must say they had this kind of right—a kind of possessory right—which some high authorities call a *quasi*-proprietary right; and regard as tantamount to proprietary rights in case of possession.

By the Chairman:

Q. It was not so much the legal question that I was getting at as something in close connection with the objects of this Committee, in regard to showing the resources of this country. At a time that you know of, and I know of, the Hudson Bay Co. held three rights in British North America. They had their charter rights

to Rupert's Land, proper, the waters of which fall into Hudson Bay. They held the portion north of the watershed and extending to what is known as Alaska—they held that by a license separately from the Crown, that is the exclusive right to trade. In addition to that they bought the right from the Russian Government to trade in Russian America, called Alaska, for a sum of £10,000, I believe, and a certain number of otter skins annually. They held these three rights—I believe that is correct? A. Yes, only as to part of Alaska; it was not all of Alaska. It was a certain portion only along the coast. They paid 2,000 otter skins a year; that was the lease.

Q. That right was abrogated at the time the Russian Government sold the country to the United States? A. Yes.

Q. Now, the Russian Government saw in that far northern country a value equal to \$7,500,000. Now, the question may come up before the Committee as to the value of the exclusive right to trade in the region comprised in this investigation—that is, the fur region proper of the Mackenzie River district. Can you give us an idea of the quantity of furs exported from that district, and the profits on them?

A. You mean the fur trade alone—the value to the exclusive right to the fur trade? I cannot say, but I can say this much from the returns, that I have some data to go on. After my father's death all his proprietary accounts passed through my hands.

Q. When did he die? A. In 1849, when I was at the bar. I can only make a general statement to this effect.

Q. Have you any knowledge of what the exclusive right to the sealing and whale trade at the mouth of the Mackenzie River would be worth? A. No, that was always open. The only source of wealth to the company in that whole region is the fur trade. They do not engage in any whaling or fishing trade there or anything else but the fur trade as to the Mackenzie district, but it has always been regarded as a most valuable portion of the Hudson Bay territories.

Q. A witness, last week, stated that large quantities of whale and seal oil could be got there but for the cost of transportation? A. Yes.

Hon. Mr. MACDONALD (B.C.)—I know the lease of the Alaska Seal Company is in the neighborhood of \$300,000 a year. That is for the right to catch seal only. The whale trade is open to everybody.

The WITNESS—I know the lease of 1825 from the Russian Government by the Hudson Bay Company from latitude 54° 40', the northern limit of our land, to the head of Cross Inlet, about half way to Sitka, they paid 2,000 otter skins per annum.

Hon. Mr. MACDONALD (B.C.)—Supposed to be worth £2,000 per annum.

The WITNESS—Yes, £2,000 sterling; it meant land otter.

By the Chairman:

Q. Do the United States Government get a royalty on their mines in Alaska? A. They have no royalty on mines, but they have on timber and from other sources amounting to \$300,000 per annum more.

Q. They derive a revenue of \$600,000 from Alaska? A. Yes, from what they paid \$7,000,000 for.

Q. You have mentioned in your book the value of the rivers that flow eastward into Hudson Bay. You mentioned salmon, and further up these streams you say that enormous quantities of fresh water fish can be had; how many of these rivers flowing into Hudson Bay from the region in question have salmon in them? A. The Churchill, certainly. As to the Hayes River, where York Factory is situated, I cannot say positively. I never heard of their being found there. I do not think there are salmon south of York Factory or at York Factory, but certainly there are at Churchill.

Q. Do you think salmon would be found in the small streams north of Churchill River? A. Yes, all of them. Franklin reports the fact that their interpreter, Augustus, a very intelligent man who had learned English, says that the salmon they found at the mouth of the Coppermine and the mouth of the Mackenzie were the same that they found at the east. They are found at the mouths of rivers all along the Arctic coast.

By Honorable Mr. Power :

Q. Mr. Christie told us that salmon are not found in the Mackenzie? A. Simpson and Franklin say that salmon are found at the mouth of the Mackenzie and at mouth of the Coppermine, and the interpreter Augustus told Franklin that the salmon were precisely the same as those they get at Churchill and along all the coast north of Churchill.

By Honorable Mr. Macdonald (B.C.) :

Q. Why would not those salmon go up the rivers to spawn in the shallow waters? A. I believe they do. They are found at the mouth of the Coppermine which is a shallow stream. As appears from Dease and Simpson's journal there seems to be a permanent difficulty of access to the mouth of the Mackenzie from the eastward. Franklin's journal also says that. The only access seems to be from the west through Behring's Straits. Simpson with boats reached Point Barrow, and from the west the boat of the British vessel "Blossom" reached the same point.

By Honorable Mr. Power :

Q. Do you know any reason why the "Blossom" could not get any further east than that? A. I suppose because the water along the shore is shallow.

By Honorable Mr. Macdonald (B.C.) :

Q. Captain McClintock went to that point did he not? A. Yes, he went right through there. Simpson states that the principal difficulty was the shallow water. They made their boats especially flat for that. Two or three miles from the land the depth would be on an average two to three feet.

Q. The rivers carry out a great quantity of sand and silt, I suppose? A. Yes. As to the channels of the Mackenzie, most of them were found to be shallow, but the western one was deep. Simpson remarks that Franklin had a difficulty about that on his first expedition. The channel that Simpson followed was five or six feet deep and there is no difficulty as to that.

By Honorable Mr. Reesor :

Q. That would not be deep enough for sea-going vessels, of course? A. No.

By the Chairman :

Q. The Admiralty chart shows a circle of islands opposite the mouth of the Mackenzie, which would seem to make an excellent harbor apart from the river? A. There are not many harbors, especially on the west side; on the east side there are, but they are too far away.

Q. Is it your opinion that a properly constructed steamer could pass through Behring's Sea and Straits and the Arctic Sea to the mouth of the Mackenzie? A. Yes, that is my impression that a properly constructed steamer, with a screw properly guarded from the ice, and drawing no more than five or six feet, would have no difficulty in entering the Mackenzie.

Q. And passing up how far? A. Up to Fort Simpson and up to Great Slave Lake, the navigation of over 1,000 miles. Then from Slave Lake to Chippewyan on what is called the Slave River (which is merely a continuation of the Mackenzie) there are four rapids close together which interrupt navigation.

Q. The Committee have, at their own expense, had a small map lithographed to accompany their report. I would like you to take one of these and mark on it the breaks in the navigation on the Great Slave River and the Athabasca. Mark with a heavy blue line where the river is perfect navigation and some other color where the break occurs, and put opposite to it the length of the break. Where you cannot speak from your personal knowledge please get it from the best sources of information at your command? A. I will do so.

The Committee adjourned until to-morrow at 11 a.m.

OTTAWA, Tuesday, 17th April, 1888.

The Committee met at 11 a.m.

The following list of persons to whom questions have been sent at various times, was read :—

His Grace Archbishop Taché, St. Boniface, Man.
 The Most Rev. the Metropolitan of Rupert's Land, Winnipeg, Man.
 Hon. Sir Donald A. Smith, K.C.M.G., Montreal.
 Captain Craig, Prince Albert, N.W.T.
 Dr. Bain, Prince Albert, N.W.T.
 Rev. J. Brick, Mackenzie River Diocese.
 Hon. Wm. Christie, Brockville, Ont.
 William Cust, St. Albert, Alberta, N.W.T.
 Hon. Lawrence Clarke, Chief Factor, &c., Prince Albert, N.W.T.
 Henry King, Esq., Fort Pelly, N.W.T.
 W. P. Wadsworth, Esq., care of Dept. Indian Affairs, Ottawa.
 Captain Smith, Hudson Bay Company, Edmonton, N.W.T.
 Ex-Judge McLeod, Club Chambers, Ottawa.
 Chief Factor McLean, of Hon. Hudson Bay Company, Lower Fort Garry, Man.
 Hector Mackenzie, Esq., Arctic Voyageur, Winnipeg, Man.
 Hon. James W. Taylor, United States Consul, Winnipeg, Man.
 Chief Commissioner Wrigley, Hon. Hudson Bay Company, Winnipeg, Man.
 Hon. Mr. Hardisty, Senator, care of Hudson Bay Company, Winnipeg, Man.
 Captain William Kennedy, F.G.S., Arctic Explorer, St. Andrew's, Man.
 Dr. Rea, C.M.G., Arctic Explorer.
 The Very Rev. Vicar General of the Diocese of St. Boniface, Man.
 Major Mulvey, Alderman, &c., Winnipeg, Man.
 Charles N. Bell, Esq., F.G.S., Secretary Board of Trade, Winnipeg, Man.
 George H. Hamm, Esq., St. Boniface, Man.
 James Taylor, Esq., Messrs. Lyon, Mackenzie & Powis, Winnipeg, Man.
 Hon. Colin Inkster, Sheriff, &c., Winnipeg, Man.
 Alex. Logan, Esq., ex-Mayor of Winnipeg, Man.
 Charles Mair, Esq., Prince Albert, Saskatchewan, N. W. T.
 Col. Sproat, Prince Albert, Saskatchewan, N. W. T.
 Chief Commissioner Herchmer, North-West Mounted Police, Ottawa, Ont.
 His Lordship Bishop Grandin, St. Albert, N.W.T.
 Rev. Father Lacombe, O.M.I., Calgary, N.W.T.
 John Gunn, Esq., Lower Fort Garry, Man.
 Capt. Hugh J. Macdonald, Barrister, &c., Winnipeg, Man.
 Ex-Chief Commissioner Graham, Victoria, B.C.
 Officer Hudson Bay Company in charge of Fort Alexander, B.C.
 do do do Fort Vabine, B.C.
 do do do Fort Vermillion, Peace River District.
 do do do Little Red River do
 do do do Fort Chippewyan do
 do do do Battle River do
 do do do Dunvegan do
 do do do St. John do
 do do do Hudson's Hope do
 do do do Fort McMurray, Athabasca River District.
 do do do Isle à la Crosse.
 do do do Green Lake.
 do do do Lac la Biche.
 do do do Lesser Slave Lake.
 do do do Fort Yukon, Mackenzie River District.
 do do do Fort Simpson do do
 do do do Fort Liard do do
 do do do Fort Reliance do do
 do do do Fort Good Hope do do
 do do do Fort Rae do do
 do do do Fort Smith do do
 do do do Fort Norman do do

- R. MacFarlane, Esq., Stewart's Lake, B. C.**
Adam MacBeth, Esq., Prince Albert, Saskatchewan, N. W. T.
His Lordship Bishop Pinkham, Calgary, Alberta, N. W. T.
His Lordship Bishop Clut. Diocese of the Mackenzie River, care of Rev. Father Oblate, Visitation St., Pierre St., Montreal, P. Q.
His Lordship Bishop Farand, Isle à la Croix via Edmonton, Saskatchewan, N. W. T.
His Lordship Bishop Lafêche, Three Rivers, P. Q.
His Lordship Bishop Bompas, Mackenzie Diocese of the Most Rev. Metropolitan of Rupert's Land, Winnipeg, Man.
The Very Rev. the Archdeacon of the Diocese of Mackenzie River care of the Most Rev. Metropolitan of Rupert's Land.
Ex-Alderman Macdonald, formerly of the Mackenzie River, Winnipeg, Man.
Andrew Flett, Esq., Prince Albert, N. W. T.
Henry Mackenzie, Esq., Mackenzie River District.
Rev. Mr. Garrioch, Mackenzie River District.
Hon. Mr. Hamilton, Peterboro', Ont.
Captain Peter McArthur, care of Duncan McArthur, Winnipeg.
Captain McArthur, Banker, Prince Albert, care of Duncan McArthur, Esq., Banker, Winnipeg.
Frank Oliver, Esq., Editor Edmonton Bulletin, Edmonton, N. W. T.
P. G. Laurie, Esq., Battleford, N. W. T.
Adrian Neison, Esq., of Bad Throat River, Selkirk, Man.
Amedée Forget, Esq., Clerk North-West Council, Regina, N. W. T.
Vicar General, Mackenzie River.
J. A. Secreten, Esq., C. E., Winnipeg, Man.
Walter Moberly, C. E., Winnipeg, Man.
Rev. John Macdougall, Winnipeg, Man.
Rev. Father Hugonnard, Industrial School, Qu'Appelle, N. W. T.
Thomas McKay, Esq., Prince Albert, Saskatchewan, N. W. T.
Molyneux St. John, Esq., formerly Asst. Indian Commissioner, Montreal, P. Q.
His Honor Lieutenant Governor Dewdney, Regina, N. W. T.
His Honor Lieutenant Governor Nelson, Victoria, B. C.
Joseph Armstrong, Esq., New Westminster, B. C.
Henry McKenny, Esq., St. Albert, Alberta, N. W. T.
Major Bedson, Warden, &c., Stony Mountain, Man.
Hon. Walter Robert Bown, Ex-Member North-West Council, Ottawa.
H. J. Moberly, Esq., C. E., care of Hudson Bay Co., Winnipeg, Man.
Capt. MacDowall, M. P., Saskatchewan, Prince Albert, N. W. T.
Nicholas Flood Davin, Esq., M. P., Assiniboia, Regina, N. W. T.
William D. Perley, Esq., M. P., Wolseley, Assiniboia, N. W. T.
Donald W. Davis, Esq., M. P., Fort McLeod, Alberta, N. W. T.
A. W. Ross, Esq., M. P., Vancouver, B. C.
William B. Scarth, Esq., M. P., Winnipeg, Man.
Hon. Joseph Royal, M. P., St. Boniface, Man.
T. Mayne Daly, Esq., M. P., Brandon, Man.
Robert Watson, Esq., M. P., Portage la Prairie, Man.
Edgar C. Baker, Esq., M. P., New Westminster, B. C.
David Wm. Gordon, Esq., M. P., Nanaimo, B. C.
John A. Mara, Esq., M. P., Kamloops, B. C.
Edward G. Prior, Esq., M. P., Victoria, B. C.
James Reid, Esq., M. P., Quesnelle, B. C.
Rev. A. E. Greene, Grenville, Nass River, B. C.
Rev. Thos. Crosby, Fort Simpson, B. C.
W. Duncan, Esq., J. P., Metlakatla, Alaska,
Rev. E. R. Young, Brampton, Ontario.
Hon. A. G. B. Bannatyne, Winnipeg, Man.
George MacTavish, Esq., Port Colborne, Ont.

Donald Ross, Esq., Edmonton, N.W.T.

His Lordship Bishop Worden, Albany, on Hudson Bay, via Mattawa, Ottawa River.

Archdeacon Vincent, Albany, on Hudson Bay, via Mattawa, Ottawa River.

C. S. Drummond, Esq., Navigation Company, Winnipeg, Man.

Vice-President Navigation Company, Winnipeg.

Hugh Sutherland, Esq., President Hudson's Bay Railway, Ottawa.

Chief Builder, Athabasca Steamer, via Edmonton, N.W.T.

Professor Selwyn, C. M. G., Geological Survey, Ottawa.

Dr. Dawson, Geological Survey.

Professor Bell, Geological Survey.

Professor John Macoun, Geological Survey.

Mr. Lowe, Ottawa.

J. B. Hurlbert, M.D., LL.D., Ottawa.

Mr. Cochrane, Geological Survey.

M. K. Dickinson, Manotick, Ont.

George H. Braddenburg, Ottawa, Ont.

W. J. Morris, Esq., Perth, Ont.

Joseph Finlayson, Esq., Prince Albert, N. W. T.

Charles Carpmal, Esq., Superintendent Meteorological Service, Toronto.

Rev. Father Seguin, Fort Good Hope, Mackenzie River.

The following letters were read :—

From Bishop Clut :—

"I have received your letter dated the 9th inst., and will add to the series A, B and C. I will leave Montreal by the Grand Trunk Railway on the 19th at 5 p. m., and will be at the Scholastique at Archville on the 20th at 11 p. m., and I will do my best to appear before the Committee."

Also the following letters from the Bishop of Three Rivers :—

"I send you back the blanks without answering the questions they contain for the good reason that I have not been in the Valley of the Great Mackenzie River. I passed three years in the valley of the English River and at Isle à la Croix."

Honorable Edgar Dewdney, Lieutenant Governor of the North-West Territories; called and examined.

By the Chairman :

Q. Will you please give any information you can concerning the portion of the country embraced in our enquiry that you have visited? A. I, of course, as you can imagine, take a great deal of interest in this enquiry, and I was very glad that I was asked by the Chairman of the Committee to come before you and give any information in my possession. When I received the application first from the Chairman I was under the impression that the scope of the enquiry extended only to the East of the Rocky Mountains, and as I have no personal information of that portion of the country north of the Saskatchewan, I did not think I could be of any service to the Committee, but on further enquiry I was told that the limits of the country, concerning which you are seeking information, extend west of the Rocky Mountains. Until a few minutes ago I thought it went a little further until I saw the scope of enquiry by examining the map in the Committee Room. I saw that it embraced a portion of the country known to us in British Columbia as the Peace River Mines country—that is the Omica Mines, which were discovered in 1869. Of course if I am limited to that portion of the country, I can give you my personal experience and knowledge of it, but it embraces only a very small portion of what is known as the Mackenzie Basin.

By Honorable Mr. Turner :

Q. That is west of the Rocky Mountains? A. Yes.

Q. What is the latitude and longitude of the Omica Mines? A. The latitude is about 56 degrees north. A mining excitement was started there by the miners of Cariboo going some three hundred miles north into that country. A few of us who were settled in the upper part of British Columbia in 1868-69, discovered some very

valuable mines in what was known as the Peace River country. The Omenica River is a stream that runs into the Finlay a branch of the Peace River. I was interested in these mines, having been interested in starting the exploration party up there. An excitement was started and several hundred men went in—probably a thousand men altogether. They were disappointed the first year and the whole of them left except about 80, and condemned those who had induced them to go in, as is generally the case in a new mining country. They came away giving very bad accounts of the Omenica country. In the fall of the year an old servant of mine, named Jamieson, went down the country and got on to a little creek which was afterwards called Jamieson Creek. He was accompanied by a man named "Nigger Dan," who was living until about a year ago. They came back and reported to the 80 men who were left in the country and who were still undecided whether to return south or not, that a very valuable creek had been discovered, that they had prospected it some miles up and brought back with them some samples. The merchants, who were heavily loaded down there, said to the miners, "we will fit you out and give you what you require, if you will go down there and see what can be done on the creek." The men had some hesitation in going because the reputation of "Nigger Dan" was not the best. However they decided on sending two Californian miners, one Jim May, and a man named McMartin, down to examine the creek and they said: "If these men confirm your reports we will fit out and go there." In a few days the miners returned and said there was no doubt it was a very rich creek. They packed up and started with their packs travelling night and day. They took candles and lanterns with them in order to travel by night, so that they could pick out the best mining locations. Another discovery was made, and I being interested determined to go up and see myself, what the mines were like. I left the mouth of the Quesnelle River in the month of November. The Quesnelle enters the Fraser River about latitude 53. It was on the high road to Cariboo, near where I was living at the time. It would be about 500 miles in to the mines from there. I started up and took a friend with me and when we reached Tatla Lake, he decided to return, so I went on myself. I met all these men coming back; they had closed up for the winter. They all had money, from \$500 to \$1,000 apiece. However, I was determined to go down and I went to the mines and prospected for myself and located some mining grounds. Then I returned to Tatla Lake landing and had returned there only a few days when the lakes froze and I was able to get back on snow shoes. I came down to Victoria. The Government asked me to make a report of the mines, which I did, and the following spring they were very anxious to get easy access into the mines to furnish supplies to the miners, and they asked me to explore a route from the mouth of the Skeena, which falls into the Pacific about the north end of Queen Charlotte Islands. I undertook that in 1870, the year that British Columbia was admitted into Confederation. I explored in from the coast, I went up the Skeena River and laid out a town called Hazelton at the head of navigation, and I laid out a road from there into the Omenica Mines. That route was used then during the time that a large population, comparatively speaking, stopped there.

By the Chairman:

Q. That was really the first entrance into that country? A. Yes; by the following year most of the travel went that way. They went up to the Skeena from Victoria in Hudson Bay boats and then took canoes and went up the river, and then started across, getting Indians to take their supplies in from the head of canoe navigation. That is the experience I have had of that portion of the country. I thought I would tell you that in order to show that the head waters of the Skeena and the lakes of the neighborhood are really similar to the Omenica country that I am going to speak about.

Q. The head waters of the lakes you speak of are really the dividing line between the Peace River head waters and the waters flowing west? A. Yes; immediately across the summit, between Tatla Lake and Omenica River, as soon as you strike the summit the waters run down into the Peace River. The river I struck was the Omenica, which runs into the Finlay and thence down to the Arctic Sea. As soon

as you get into the waters of the Omenica you catch a fish which we used to call the Arctic trout, with a large fin on the back that stands up like a sail. It is a peculiar fish but very good to eat

By Honorable Mr. Turner :

Q. You ascend the Skeena River by canoes. How far have you to portage into the Omenica River? A. From Hazelton across to the Babine River is about 48 miles, I think.

Q. Is that all the portage you have? A. No, there is another. You cross the Babine at a place called the Fisheries, where immense quantities of fish are caught. It is the point where the Hudson Bay Company buy all their salmon from the Indians. They put up their fish there.

Q. Fresh water salmon I suppose? A. No; salt water salmon. They run up the Skeena and then up the Babine River. The Babine River runs into the Skeena and you ascend it about 30 or 40 miles above Hazelton.

Q. Hazelton is the head of the Skeena River? A. We call it the head because it is the head of canoe navigation. You can go a little higher with canoes. The valley which you have to take across over into the Babine River starts from there. It is called Agwilgate. You cross over that portage and across the Babine River at the outlet of Babine Lake. It is a long lake, some 70 or 80 miles in length—a magnificent lake.

By the Chairman :

Q. You have mentioned that in the head waters of these rivers flowing to the west you find the salmon in large numbers. They go there to spawn I suppose? A. Yes.

Q. How far from that spot is it to the waters running to the east? A. The salmon that are caught in the Babine Lake go up the Skeena River from the coast up the Babine River into the lake. There is another string of lakes east of that again—that is Stewart Lake, Lake Tremblay and Tatla Lake, over 120 miles in length, I suppose, the three of them. They are in communication with the waters of the Fraser and the salmon that go up there ascend by the Fraser into these lakes. The salmon in the Babine River go up the Skeena.

Q. Would the distance be too great to try the experiment of putting salmon spawn deposited in the sources of the rivers running west, into the waters running east? A. No. There would be no difficulty about that at all.

Q. I ask the question because I have heard contradictory evidence about the existence of salmon in the Mackenzie River. A witness yesterday declared positively that salmon are found there. Another witness said the same thing, but two other witnesses have stated positively the opposite of that? A. Certainly, salmon spawn could be taken out of the waters of Stewart Lake and put into the waters flowing east.

By Honorable Mr. Turner :

Q. Do the salmon that come up the Skeena River and up the Fraser River meet in the same lake? A. No, they are in separate lakes. There is a big range of mountains between them.

Q. Is the Skeena River a muddy river like the Fraser? A. At high water it is muddy.

Q. Is the Fraser always muddy? A. Yes, all the year round except in the very depth of the winter.

Q. And the Skeena is clear for part of the year? A. Yes; between the Babine River, on the route I explored, I crossed over another summit of 5,000 feet to the waters that communicate with the Fraser—that is the lake known as Tatla Lake, a very large sheet of water. After crossing Tatla Lake there is another summit not so very high—about 3,000 feet—and then you come to the waters of the Peace River.

Q. Is there any agricultural land around any of those lakes? A. Yes, there is some around Tatla Lake, and particularly on the river that runs out of Tatla Lake. It is called the Taché River.

Q. How is it on the Skeena River? A. On the Skeena River there is a good deal of splendid agricultural land. I arrived at Hazelton in the month of May—early in May. I waited for a few hours. I was told I might have to remain several days before the ice would move out, but it cleared out in a few hours, and I arrived there early in May and found the snow all gone and the flowers were out.

Q. By the 1st May? A. Yes. There is a little flower which grows there that the Indians call the snow flower.

Q. How about the timber on the Skeena? A. There is some very good timber on the Skeena.

Q. Does it continue up the river? A. Yes; on the Frying Pan Pass there is magnificent timber. Going through there I found the greatest windfalls I ever saw. In going through there I have travelled four or five miles without touching the ground at all, travelling all the way on these wind falls. Some of them were 20 feet above the ground.

Q. The Douglas pine? A. Yes.

Q. Entirely? A. No, there are different kinds of pine and other trees.

Q. Your gold mine was on the west side of the Rockies? A. Yes, on the upper waters of the Peace River. We had the Vital Lake, named after a French Canadian who discovered it, Silver Creek, Granite Creek, Discovery Creek, Jamieson Creek—those are all, that is the limit of your enquiry.

By Honorable Mr. Gowan:

Q. Did you ascertain the exact latitude of any place where you were? A. Yes, I took the summits with an aneroid.

Q. Did you ascertain the exact height above the sea level? A. Yes, I can give you the highest point. It was on the pass that I was speaking of—the Frying Pan Pass. That is 5,600 feet above the sea level.

Q. Exactly 5,000 feet? A. No, but as near as you can get it with the aneroid.

Q. Did you determine with accuracy any particular point—that is, the exact position of it? A. I could not tell you that without my notes. I made a sketch of the whole country—you mean in reference to the lakes?

Q. Its exact position? A. The summit would be where the water runs both ways. The summit I speak of would not be considered with regard to placing salmon in the waters running into the Mackenzie. The summit is 3,020 feet high.

By the Chairman:

Q. Can you tell us the height of Lake Tatla above the sea, and the height of the lake to the north of that? A. Lake Tatla is about 1,800 feet above the sea level.

By Honorable Mr. Power:

Q. Where is the water shed—the height of land which divides the waters flowing into the Arctic from the waters flowing into the Pacific? A. At Tatla Lake. It would be about twenty miles from the head of the lake. There is a stream that runs into the lake which has a course of about twenty miles from the head of the lake. Then there is another stream that runs into the Omenica, the Finlay, which is a branch of the Peace River.

By the Chairman:

Q. How wide a distance separates those waters? A. That portage from Tatla Lake until you strike the Omenica River proper is about 30 miles.

Q. Then we are to understand that it would be easy to transport the spawn of the salmon from the waters of this little river to the west? A. I am not sure whether they get into that little stream or not.

Q. Do they get into Lake Tatla? A. I am not quite sure, but I think they do. Then there is also another route which I have not travelled, that runs into Nation Lake. It is travelled by the miners a good deal. It is south of Tatla Lake. It is a much larger branch than the Omenica River. It runs into the Parsnip River which is a tributary of the Peace River.

Q. Do you know the height of Nation Lake above the sea? A. No, I do not know of any scientific man who has gone in that way at all. The miners have travelled it a good deal.

Q. The Committee would be obliged if from your notes, or any other source you can get it, you would give us the height above the sea of the waters flowing east and west? A. Yes, I will do that. I suppose you mean where it might be considered that salmon spawn could be carried from one point to another.

THE CHAIRMAN.—I asked the Department of the Interior, in a letter, to indicate on some map which they consider the most reliable, the scope of this enquiry, telling them that I wished the whole Basin of the Mackenzie and the waters between that and the Hudson Bay—that is, everything north of the Saskatchewan watershed. They have sent me a map which I will pass around presently for your inspection, in which they give the total area at 1,260,000 square miles. They give the approximate length of the coast line of this region extending from near Fort Churchill on Hudson Bay to a little beyond the mouth of the Mackenzie River, as a coast line of 5,000 miles, and this does not include the coast line of many deep indentations of the coast. For instance, Chesterfield inlet would seem to be 200 miles deep. This line cuts across the mouth of these and gives a coast line of 5,000 miles. The Department, however, seemed to be aware that none of the maps that we have at present published can be relied on as to the geography of the more northern part of the country. However, I fancy that these coast lines have been pretty accurately fixed by the various Polar expeditions and the land expeditions that have gone along the shores of Hudson Bay. We have also a very copious series of answers from Dr. Dawson of the Geological Survey.

The Committee adjourned until 11 a.m. to-morrow.

OTTAWA, Wednesday, 18th April, 1888.

The Committee met at 11 a.m.

The following letters were read:

"ST. PETER'S CHURCH, 107 VISITATION ST.,
MONTREAL, 17th April, 1888.

"The Honorable Senator SCHULTZ.

"DEAR SIR,—I have concluded my answers to the series of questions sent me. I hope that the Senate Committee appointed to enquire into the resources of the Great Basin of the Mackenzie River will receive my work favorably. I enclose herewith statement of the temperature taken at Fort Good Hope during the winter of 1885–86 and the month of January, 1887. I have great pleasure in forwarding to your Honorable Committee by post the result of my labors in order that the Committee may have time to examine it before I appear at the Senate on the 20th instant, at eleven in the forenoon. You will then be in a position to put to me such questions as you think proper, and if you wish it, I will point out on a map, which will be presented to me, the arable portions of the country, the wooded sections and the barren grounds. If by my answers I shall be able to help the Committee to become more thoroughly acquainted with these immense regions I shall be pleased.

"Awaiting the honor of appearing before the Committee, I beg to subscribe myself, dear Senator,

"Your most humble servant,

"ISIDORE CLUT, O.M.I.,

"Bishop of Arindele."

"OTTAWA, 17th April, 1888.

"DEAR SIR,—In reply to yours of the 16th instant, I send you a statement showing you the value of oil and furs exported from Winnipeg, Victoria and Vancouver from 1885 to 1887, inclusively.

"Yours truly,

"M. BOWELL.

"Honorable J. SCHULTZ, The Senate."

STATEMENT showing the Exports of the undermentioned Articles from the Ports of Winnipeg, Victoria and Vancouver during each year, from 1885 to 1887 inclusive, and also for the six months ending 31st December, last.

Articles.	Ports.	1885.		1886.		1887.		Six months ending 31st December, 1887.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Whale oil.....	Winnipeg.....	5,229	\$ 2,400	6,436	\$ 3,864		\$		\$
Seal oil (none exported)....	Winnipeg.....		268		94				
Furs and skins of fish and other marine animals.....	Winnipeg Victoria.....		164,592		211,096		287,577		119,373
			164,800		211,190		287,377		119,373
Furs, dressed.....	Winnipeg.....		2,371		20		75		
	Victoria.....		9,690						
			12,031		20		75		
Furs, undressed.....	Winnipeg.....		887,823		592,653		656,905		714,508
	Victoria.....		382,829		246,750		289,868		187,443
	Vancouver.....								102
	(Independent port from 1st of July, 1887 only.)		1,230,651		839,468		956,273		902,051

NOTE.—York Factory being an outpost of Winnipeg, its exports are included in the returns from that Port.

CUSTOMS DEPARTMENT,
OTTAWA, 17th April, 1888.

Lieutenant Governor DEWDNEY re-appears and continues his evidence as follows:—

When I found yesterday morning that I was obliged to leave the Committee Room, Senator Gowan was making some enquiries in reference to the summit which divides the head-waters of the streams flowing to the Arctic Sea from those streams flowing into the Pacific. He was anxious to know whether salmon spawn could be taken from the waters flowing westward and put into the waters flowing to the north-east, as it was reported there was no salmon in the Peace River waters. Since then it has come to my recollection that there is a point which would be more easy of access than the one of which I speak, that is near the Big Bend of the Fraser River, on which there is a small portage, called the Giscome Portage. It was by that route that the first supplies went into this Omenica country. In fact boats were built in the harbor of Victoria and taken all the way up the Fraser and across this portage into the waters which flow into the Peace River. There is no elevation to speak of. I think a slide is built across the portage, by which they drag their boats across from one stream and put them into the other. If it is considered advisable at any time to make the experiment, that would be the most convenient point, because there are immense quantities of salmon in the Fraser and its tributaries.

Q. You would put the spawn somewhere in the Nation Lake? A. No, into McLeod Lake. It used to be called Trout Lake in old days and then it was named McLeod Lake. It was at that point that the first post of the Hudson Bay Company was established west of the mountains.

Q. Is that Fort MacLeod? A. Yes, that was established in 1805 I believe.

Q. I notice that that stream leads into the Parsnip River, one of the branches of the Peace River? A. Yes, the streams from that point run down to the Parsnip.

Q. Where would you suggest putting the spawn in? A. I think that would be a favorable point and more easy of access than the point we were speaking of yesterday, where the summit is 3,000 feet high.

Q. I notice quite near there that there is a river called the Salmon River which flows from near the Nation Lake down, not far from the Lake you describe, and joins the Fraser River at the Big Bend. That name would suggest that there are salmon there? A. There are none there. With regard to the Omenica country, especially, I spoke of the different creeks we have there. There is one peculiarity in reference to these creeks in the Omenica country that almost the whole of them carry a large quantity of native silver and in such large quantities that the miners, particularly on Silver Creek and on one or two other creeks, when they have washed up the gold, found so large a quantity of native silver in it that they divided the silver from the gold and when they paid out at the end of the week they paid part in silver and part in gold. There is one piece in the Geological Museum taken out of Hotel Creek, or Silver Creek, which is as large as a hen's egg. The pieces vary from that size down to the size of a bean.

By Honorable Mr. Macdonald (B.C.):

Q. There is no mining on the Omenica now? A. Yes, Jim May mines there yet.

Q. There are no miners going in there now, I suppose? A. No. They are working some of the old mines there yet.

Q. Most of them go to the Cassiar mines now? A. Yes. You see it is a very difficult country to get into and when other mining camps are discovered they go to them.

By the Chairman:

Q. Would that country be commercially related to the east side of the mountains or the west? Is it easier to go to Fort Edmonton or down to the coast at that point? A. It would be easier to get down to the coast or even through by the main route through British Columbia to Quesnelle.

Q. Would you tell us something about the gold deposits? A. In those different creeks some of them were extremely valuable and extremely rich. The beds of the creek appear to be pretty much worked out. Of course there is the quartz there,

but it has not been worked, for the reason that the quartz in the Cariboo country has not been worked—there is no way of getting machinery in there.

Q. There are quartz ledges on the upper waters of the Peace River are there not? Oh, yes. In this Omenica country there is quartz all through.

Q. Have any assays been made of the quartz? A. I cannot specify any particular ones, but there have been some made I know.

Q. Is it supposed to be as rich in gold as in some other parts? A. I think so. We think the mines have been as rich on Vital Creek. When it was first discovered the gold which they took out of some portions of it was as rich as any that I ever heard of, but the diggings were shallow and when they ceased to find gold they dropped off and never went deep.

Q. There would be the great difficulty of getting in supplies also I suppose? A. Yes. Of course at the time of the excitement they took a steamer up there from Soda Creek, that is near Quesnelle, up the Fraser as far as Fort George and then up the Nechachoe River into Stewart's Lake. Then goods were taken from Fort George on the south eastern end of Stewart's Lake in the steamer and were run up to Tatla Lake—that is 150 or 180 miles. The goods were packed over the road from the mouth of Quesnelle to Stewart's Lake overland. The steamer was taken overland that way—they had great difficulty in getting it up—for the purpose of working on those northern waters. The goods were taken on the same road that the Western Union Telegraph Company used when they were building their line. They went through this same country 25 years ago before the Atlantic cable was a success, in anticipation of going by that way through Russia. When the Atlantic cable was declared a success they stopped work. Through all this country they have the wires and poles standing yet.

Q. How far did they go up? A. They went up to the small creek about ten miles above Hazelton to Kixpiox Valley; a very beautiful valley it is. I went up it to the head-waters, as far as the telegraph line went, in order to report to the Government. They stopped at the head of that valley. They got into an immense amphitheatre of mountains and did not know how they would get out, and when they heard of the success of the Atlantic cable they abandoned the work. They go to Tatla Lake and then across the portage 30 or 40 miles and take down the Omenica River in boats.

Q. What are we to understand about the possibilities of pasture or arable land in the valley of the Nation and the Omenica River? A. There are heavy grasses all through that country, wherever it happens to be open land. There are very beautiful valleys on the Omenica River. That I know personally, having been on it. The valley varies in width from two to three to five or six miles and beautiful land on both banks of it. As soon as you get into the mountains it is timbered heavily.

Q. You told us yesterday something about the climate and the snowfall there. Is the snow there deep in winter? A. Yes, there is a pretty heavy snowfall. I came out there about the end of December or the beginning of January, and I should say that there was about four feet of snow. At any rate, I was on snow shoes and I know I sank three feet a good many miles of it. It was a very soft snow in the early part of the season. In going over the Frying Pan Pass the following spring on the summit, there must have been 25 feet of snow.

By Honorable Mr. Ogilvie:

Q. Do you mean to say there was 25 feet of snow on the level? A. Yes. But you must remember it is 3,000 feet above the level on the summit. We blazed the road on the way in, and some miners who were anxious to get goods in followed our track. The snow was so deep that we blazed near the tops of the trees in some places. In the spring the disappointed miners had to get down to the coast by the short road and they followed back on our tracks. Where the snow was shallow our blazes were low down on the trees, but they never thought of looking for the blazes at the top of the trees, and two or three men lost their way and their lives. The country is cut up into all kinds of valleys. These men got lost. I picked up one or

two of them on the way and saved their lives. One of them was crazy when we picked him up.

By the Chairman :

Q. At Fort McLeod have they any garden? A. I do not know of any.

Q. Has any attempt at agriculture or anything of the sort been made there?
A. I do not know of any.

Q. Have you been up as far as the head-waters of the Finlay River? A. No, I have never been on the Finlay River.

Q. Have you heard anything of its character from miners who have been there?
A. I know several who have been in through that country.

Q. The Committee would like to know what your general impression is derived from that source? A. They described the Finlay and the Parsnip as being a very large stretch of navigable waters. The Finlay is a large river at that point. I have heard them speak of 200 miles of navigable water on the Finlay branch.

Q. When you speak of the navigable waters do you mean navigable for canoes? A. For stern wheel steamers. There was a man named Pete Toy who lived for many years where the Finlay River runs into the Peace River. He mined there for many years and made a very good living. He was lost afterwards while out prospecting in a canoe. He devoted himself to bench mining and used to wheel his dirt down with a wheelbarrow and wash it and he made a very good living there.

Q. There seems to be one or two lakes of considerable size at the head of the Finlay, have you heard anything about them? A. No, I never heard anything about them when I was in there.

Q. We have evidence of the fact that there are whitefish in the Peace River—I suppose as far up as that fish can get. Have you the whitefish on the other side of the mountains across the water shed? A. I do not recollect whether they have got whitefish in the upper lakes—the Tatla, Babine and others—but I know we have whitefish further down south in British Columbia. People think of nothing else but salmon, and those rivers are full of them.

Q. One witness stated that boats ascended the river and that there were 50 miles of unbroken navigation in the heart of the mountains? A. Those boats that I spoke of that came up the Fraser and crossed at the Giscome Portage, and run down the Parsnip to the mouth of the Finlay, which forms a part of the Peace River. They then go up the Omenica River and by that means are brought very close to the mines there.

Q. What sized boats are they? A. Five or six ton boats.

Q. That would seem to imply from the relative size of those rivers shown on this map that it would give an aggregate navigation of something like 500 miles? A. Yes, I should think quite that. The prospecting party that I spoke of, that went up in the spring of 1870, took boats from Quesnelle mouth loaded with supplies, crossed the Giscome Portage and went down the Parsnip River to the Omenica where they left their boats to explore the country and discover these mines. Vital Creek was the first that was discovered. They prospected there through the summer until fall, when they returned to Quesnelle with their boats, reloaded with supplies and went back in the fall and wintered at the mines.

Q. That would not infer very difficult navigation of those streams. In the taking in of supplies, supposing that we were speaking of the development of the mineral resources of that part of the country, could flour, for instance, be taken in more easily from the Fraser or Dunvegan? A. I should fancy that such supplies could be more easily taken in from Dunvegan. The Hudson Bay Co. used to send supplies up to Rocky Mountain Portage on the Peace River every year, and the traders from the east used to meet the traders from the west at that point and exchange products.

Q. That is, the heavier articles of trade went up by the Peace River? A. Yes, and they used to bring horses and pack trains from Dunvegan to the Rocky Mountain House and receive there the supplies sent in from the west, and exchange for and send down a large number of moose skins from the east.

Q. You mentioned incidentally the growth of timber, could you tell us something of the forest of the Omenica Valley and on the Parsnip itself? A. In the Omenica Valley I do not recollect seeing any timber of large size. It is too high up. On the Jamieson Creek, when I was there, the fires had run all through that country and had burned it for miles. I recollect that the timber there was pretty small, mostly spruce, I think, and just the size, not over a foot or 15 inches in diameter, to be useful for mining purposes.

Q. That is for any works of that sort there would be sufficient timber? A. Yes, and I think, if I recollect right, there had been a saw mill erected on Manson Creek, that is a creek in the vicinity, which also runs into the Parsnip, on which there were some mines found close to the east of Jamieson Creek. You see the fur traders that are up there now east of the mountains—I do not know that they are located on Peace River—but in former years they took all their supplies in from the west, up the Fraser and through the mountains to the Rocky Mountain House. Those traders take their supplies in by Edmonton this year. The only difficulty in getting in from the Skeena into the mines are the summits, one between the Babine Lake and the Skeena, one between Babine Lake and Tatla Lake; then four or five miles of a crossing on Tatla Lake, and then another summit.

Q. That is going east? A. Yes, but it was thought at the time that I was sent in there by the Government to make an exploration to see if a road could be got in, that supplies could be sent in easily that way. At all events the miners themselves could get in easily that way, and a great many miners from the coast did avail themselves of that route, but no supplies were sent in except what the miners took in themselves on their backs, and what Indians packed in for them.

Q. It seemed easy to get into that country from the Nass River—that is north of the Skeena? A. From Hazelton, or little south of Hazelton on the Skeena to the Nass River it is not difficult.

Q. You have frequently mentioned the Skeena River: is it easier to get the supplies in from the Skeena to the mines or from the east to the mines? A. Provided the Skeena was navigable it would be easier to get in supplies in that way. I may say that when the telegraph line was being built by the Western Union Company, they had a boat on the Skeena which they ran up some 40 or 60 miles to a place called Mumford's Landing. I understand that this year, Mr. Smith, who built the boats for the Hudson Bay Company on the Peace River, was to go to the Skeena to make a report on that river, and as I understand to build a steamer for that river.

Q. Is he to go across the mountain to get there? No, he will go out to British Columbia and get in from that side. The only obstacle in the Skeena to prevent a steamer from going to Hazelton is a canon through which the river runs. In certain stages of the water there is no difficulty because I have run it myself in a canoe; but in very high water I think the steamer could not get through.

Q. The nearest point shown on the waters running east to the head of the Skeena is Dease Lake; then it is from Ptarmigan or Black River? A. They reach that by the Cassiar country.

Q. Going further north, can you tell us if there be any means of reaching the Upper Liard River from the navigation points on the Stikine River? A. I could not tell you. I know nothing of that part of the country. I have known miners who have gone up the Skeena very far towards the headwaters, but they returned the same way that they went up.

Q. Can you tell us how provisions are at present got into the mines of the Upper Yukon—that is the part on British territory? A. I think they are taken in by the route that Mr. Dawson went last year—I forget the name of the waters. It is north of the Stikine altogether, I know.

Q. From where did they go in at the coast? It is a long way north. I forget.

Q. We have another river further south than any shown on this map—the Smoky River, a branch of the Peace River, which seems to rise close to one of the branches of the Fraser? A. Smoky River runs into the Fraser. There were surveys made through that pass by the Canadian Pacific Railway engineers.

Q. What is the name of that pass? A. It is called the Pine River Pass.

Q. You mentioned to us yesterday that you had not been much north of the Saskatchewan watershed. The most southern point of our investigation comes down into Alberta, comes down in fact to about 100 miles north of here—(pointing to the map)? A. I have never been in that part of the country—I have never been along the mountains at all.

Q. Then in the country that you have been telling us of, west of the mountains and within the scope of our investigation, what Indian population is there?—In the Omenica country there are not many Indians. They hunt in there, but they come from the coast mostly, and go in through that way. The Skeena Indians hunt in all through that country, and also the Babine Lake Indians.

Q. Could you give us the names of the more important fur-bearing or food-producing wild animals found through there. A. There is the moose and the red deer.

By Honorable Mr. Macdonald (B.C.):

Q. It is a curious fact in connection with the Indians of that part of the country that they are kept back by the coast Indians, and are not allowed to go down to the coast at all; so that the coast Indians control the catch of fur in that district? A. Yes, that is a curious, well-known fact. The coast Indians come to the Agwilgate country, and on the Agwilgate there is annually a large Indian gathering or camp. They come and remain there during the summer and catch any amount of salmon, and the coast Indians come up there to trade with them. Although the tribes live within four miles of one another, they do not understand each other's language.

Q. They are branches of what tribe? A. No one knows. The Indians on the Skeena river are called the Skeena Indians.

Q. Are they different in appearance from the coast Indians? A. Yes, the interior Indians are different.

By Honorable Mr. Turner:

Q. Do they do anything in fur-hunting? A. Yes, they hunt a great deal. All those valuable furs, the marten, and beaver and fisher are brought down from the interior—traded to the coast Indians who bring them down. The coast Indians take up oolachan grease. It is put up in boxes of 100 to 200 lbs. The boxes are made of yellow cedar, and this grease is traded for furs and berries.

By the Chairman:

Q. Of the furs found there, how many varieties of valuable furs are caught? A. I do not know. I think they are something similar to the furs of British Columbia.

Q. What varieties of the bear are found there? A. I have seen the black bear and brown bear, and I have no doubt that they have the grizzly.

Honorable Mr. MACDONALD (B.C.)—Yes, they have the grizzly. Occasionally we get the skins of the grizzly from there.

By the Chairman:

Q. How many varieties of deer are there in that country? A. In that part of the country I know they have the moose and the red deer; and from there to the coast they have the small black-tailed deer in great numbers. In the mountains, of course, there is the siffleur, or ground hog.

By Honorable Mr. Turner:

Q. Have they the mountain sheep or the mountain goat? A. They have the mountain goat, but I do not know whether they have the mountain sheep or not.

By the Chairman:

Q. Have they the finer kind of furs? A. Yes, they have the fisher, beaver, mink, marten and lynx.

Q. Have they any rabbits? A. Yes, plenty of rabbits. It is a splendid Indian country. They live better there than at some of the Hudson Bay posts.

Q. Do you feel the effect of the warm chinook winds up as far as that? A. No, I do not think so.

Q. Apart from the list of questions, if there is any suggestion you can make with regard to the objects of our enquiry, we should be glad to have them now, or even afterwards in writing should it occur to you. I may say that letters have been sent

to the gentlemen whose names you have been good enough to suggest to us as likely to give us information, the answers to which will not be received this year, and it is altogether likely that the Committee will be continued next session; if anything should occur to you that would be valuable to suggest to us, we should be very glad to hear from you? A. I referred the other day to the immense quantities of wild hemp that grows up in that country, and to some extent in the Omenica country, and along the upper waters of the Skeena and also in the Kixpiox Valley. There is a wonderful heavy growth of that wild hemp, and the Indians find it of very great service.

Q. What use do they make of it? A. They work it up into the finest thread for sewing with, and also make heavy ropes with it with which they tow four or five-ton canoes—rope as big as my wrist.

Q. Is it different from the ordinary flax of commerce? A. Yes, it is different from the ordinary hemp.

Professor MACOUN.—There is a weed up there that we call silk weed, the bark of which has been used by the Indians on the west coast for making ropes. It is known to botanists as *Epilobium Angusti florum*.

Mr. DEWDNEY.—It grows as large as my thumb and they take out the heart of it—it is something like the fire weed.

Professor MACOUN.—Yes, it is like our fire weed, and the bark of it to my knowledge is fibrous.

By the Chairman :

Q. Would it be a plant of sufficient value to encourage the introduction of it on this side of the mountains? A. I am not prepared to say, but from the uses made of it by the Indians there, I am not sure that it would not be valuable; because the Indians make it into fish lines, nets and sewing thread.

By Honorable Mr. Kaubach :

Q. Is there any valuable timber there? A. Yes, there is plenty of good timber—cedar.

Q. And the soil, is it good? A. Yes.

By Honorable Mr. Turner :

Q. What is the oolachan grease that you spoke of? A. It is the grease of the candle fish that the Indians catch about this time of the year. It is a most delicious fish to eat. They are caught in large quantities, and the grease is taken out of them and packed into boxes made of yellow cedar, and is one of the staple articles of trade between the coast Indians and the Indians of the interior. The Indians catch oolachan through the ice, and fish for them night and day when they are running.

Q. The oil is one article of commerce, and the fish is another? Yes. The fish are not sold much, but I believe there are some white men now putting them up.

Q. What is the grease used for? A. It is eaten by the Indians, and there is a great deal of it now shipped to New York to be used for the same purposes as cod liver oil.

Mr. MACDONALD.—The fish itself is so rich that when it is dried it will burn like a candle, and is called the candle fish. It would make excellent sardines.

By the Chairman :

Q. Did I understand you to say that oolachan grease is being used as a substitute for cod liver oil? A. Yes, I believe it is so used in New York.

Mr. MACDONALD.—I prefer it to cod liver oil, it is very fine when clarified.

By Honorable Mr. Turner :

Q. Is it pleasant to the taste? A. I do not know about that. The stronger it tastes the better the Indians like it.

Mr. MACDONALD.—They use it like tallow with other food.

The WITNESS.—Yes, they use it as food, with dry halibut. The halibut is cut in slices and dried, and the Indians spread the oolachan grease on it and eat it, as we would bread and butter.

By the Chairman :

Q. You have told us of the abundance of salmon found even at the sources of the rivers running to the Pacific, do you know the difference between that kind of salmon

and the salmon caught on the east coast? A. I do not. I have never seen any of the salmon from the east coast fresh out of the water.

By Honorable Mr. Turner :

Q. It is the same kind of salmon as you find in the Fraser? A. Yes, but in the Fraser there are three or four different kinds. On the Babine Lake the Hudson Bay Company used to trade on that river as many as four or five millions of salmon, and after they had made their trade of the good salmon they made a second trade of the dog salmon—that is, they traded them with the Indians to feed their trained dogs on.

Q. Are there any other kinds of fish in those lakes besides salmon? A. Yes, magnificent trout. At the outlet of the Babine Lake I stopped once, and I had my fly rod with me, and I borrowed a canoe from the chief, ran down half a mile and anchored it in the rapids, and nearly filled the canoe in half an hour. I had three flies on my rod. There are two different kinds of trout there—one fat and short, that would fight like a bull dog; the other was long and flat-sided, just like a log—no play in him at all.

By Honorable Mr. Kaulbach :

Q. Are the salmon in the Skeena the same as those in the Fraser? A. I think so.

By Honorable Mr. Turner :

Q. Are the fish found in the Skeena, or are they confined to the lakes? A. I fancy they are in both lake and river.

Q. You have no black bass there? A. No, I do not recollect seeing any.

By Honorable Mr. Kaulbach :

Q. Does the salmon take the fly on the Skeena? A. No. Of course there are immense trout in those waters also.

Q. The fact that the salmon does not rise to the fly in the Fraser is attributed to the dark color of the water? A. The water is the same color in the rivers to the north down towards their mouth.

By Honorable Mr. Turner :

Q. I suppose the salmon have to run up through the dirty water when they are in condition to take the fly; and after getting up further into clear water they do not want it? A. I am not aware of that fact. It is a question that has been the subject of a good deal of controversy between experts as to whether the salmon that run up these rivers return to the coast or not. I know that thousands of them do not, for they are seen lying dead on the banks of the rivers.

The Chairman :

Q. So far as the Committee have yet been able to learn, the Mackenzie River and its tributaries do not differ physically from other rivers that empty into the sea from the east and the west. They seem to be the same kind of river and yet opinion is divided as to whether or not they are the same. Do you know of any reason from anything that you have seen or heard why, if salmon were put into them, they should not thrive? A. No, none at all. I do not know how far north salmon go up the streams on the eastern coast, but they are caught at Churchill, and exported from there to England. Unless the longer winter has anything to do with it, they would likely thrive at the mouth of the Mackenzie.

Q. The latitude of the Churchill is north of the latitude of the Skeena River? A. Yes.

Q. And you have salmon north of the mouth of the Skeena on the Pacific coast? A. Yes.

Q. Still you have not the long winters there that we have on the eastern coast?

By Honorable Mr. Turner :

Q. I suppose the salmon caught on the Skeena River and those caught in the Stikine River are a distinct variety of fish? A. Yes.

Q. Is it a fact that there are large canneries now established on the Skeena River? A. Yes, there are canning establishments on the Skeena.

The Committee then adjourned till to-morrow the 19th.

The following is the translation of the answers from Isadore Clut, O. M. I., Bishop of Arindele.

CHURCH OF ST. PETER,

107 VISITATION STREET, MONTREAL.

2nd Question :—A. Throughout the whole of the immense country in the basin of the Mackenzie, no river is navigable evidently during the winter ; but during the summer the Great Mackenzie River is navigable all the season, as are also the Athabasca and Great Peace Rivers, Liard River and Peel River. Generally all these rivers have a rapid current. The Mackenzie can be navigated by steamers drawing four feet of water, but as to the other rivers, as they are shallow in parts, they are not able to carry steamers except flat bottomed vessels drawing from 18 to 20 inches of water.

3rd Question :—A. It appears to me that the best means to open up the Mackenzie for traffic would be to make a railway which would run to the River Athabasca at Tawatina Landing. The Hudson Bay Company have established there a road between Calgary, Edmonton and the Landing. A railway should be extended to the confluence of the Smoking River with the Peace River, passing by the Lesser Slave Lake. From the Lesser Slave Lake to this confluence of the river the land is excellent and the road could easily be made. Already the Hudson Bay Company have an excellent cart road on which I have travelled myself. The journey from Little Slave Lake to Smoking River is between 60 and 70 miles.

4th Question :—A. The lakes of the Mackenzie Basin are so numerous that I cannot name them, nor can I indicate them to the Committee. Rev. Father Petitot has made a map of the Great Mackenzie District, so-called. If the Committee are in possession of that map they will be able to find in it ample information. The affluents of the Great Athabasca Lake and the Great Slave Lake forming part of the Mackenzie Basin can be easily navigated by small steamers, the one on the waters of the Athabasca district and the other on the Peace River to the landing at the foot of the rapids near Fort Smith, half way between Athabasca Lake and Great Slave Lake. Other steamers drawing four feet of water can run from Fort Smith to the Arctic Sea. Between the landing and the Port of Fort Smith there is a road on the left bank of the river for a distance of 20 or 21 miles. It would be very easy to establish a small railway, the country being level.

5th Question :—A. I have never been on the borders of Hudson Bay nor on the shore of the Arctic Sea. From what I can learn from the Rev. Father Séguin, who has been at Fort Good Hope, within the Arctic Circle, for 28 years, and who has been to see the native Esquimaux on the coast and on the islands of that ocean, the sea is obstructed by icebergs a great part of the short summer in that country. The delta of the Mackenzie is of considerable size. The river is divided from Point Separation, at the junction of Peel River, to the sea into a number of channels forming a multitude of islands. The channels are crooked. The Mackenzie has carried a great deal of sand a long distance from its mouth, and generally it is shallow. There is a certain difficulty in following the principal channels. At Fort Simpson from the 20th to the 25th of May the Mackenzie opens and barques and small steamers can descend the river certainly to Fort Good Hope and probably to Point Separation. I am not able to say if at this time it is possible to descend further. I doubt it because there is less water. From the mouth of the Mackenzie, at least from Point Separation to the Great Slave Lake, the navigation is open to the end of September. I made that journey myself once and arrived at my residence, La Providence, within 30 miles of Great Slave Lake, on the 8th of October in a little skiff. It is true that the summer was a little longer than usual.

6th Question :—A. Immediately above the confluence of Clear River with the Athabasca the former is obstructed by several rapids, amongst others by a cascade which crosses the river and towards the end of the Grand Rapids. On the left bank the cascade is a small affair. In my opinion it would be very easy to remove the rocks to permit the passage of a flat-bottomed steamer there. At the Grand Rapids

the difficulties are greater, but below the Grand Rapids flat steamers can navigate easily and without any danger. It is possible to ascend the river a considerable distance. I cannot say how far, for I have only ascended the river to the Little River, the outlet of Little Slave Lake. The barques of the Hudson Bay Company transfer each summer supplies between Tawatina Landing and the Little Slave Lake fort which is situated at the extremity of the lake. The lake is 80 miles long and from four to eight miles wide. I believe that flat steamers could easily make the journey from the Grand Rapids to the Little Slave Lake. Besides it is easy to ascend the Athabasca River much further than the confluence of Little Slave River. At the Grand Rapids there is an island in the middle of the river; in the right arm of the river there are large boulders or loose stones which could be easily removed at a small cost so as to permit a flat vessel to pass there. If some of the rocks were taken from the rapids and the cascades it would open up uninterrupted navigation as far up as the Rapids above Fort Smith, which is now passed by a good road 21 miles long between the landing and the port of Fort Smith. Below the latter point there is uninterrupted navigation to the Arctic Sea.

7th Question:—A. I have already explained that below the Clearwater the Athabasca is quite navigable with flat boats, but when the water becomes low there are a good many sand banks. Clearwater River is navigable only a short distance from its mouth. In summer the water is sometimes very low; besides there are five considerable rapids which are insurmountable. Above these rapids the river is quite navigable as far up as Great Portage la Loche.

8th Question:—A. The river discharging the water of Lake Athabasca and all its basin is called Rocky River as far as the landing above the rapids. There are in that river rocks here and there, but they are no obstruction to the navigation. A small steamer, the "Graham," has been running there for four years, as well as on the Athabasca and the Peace River to the falls, a short distance below Fort Vermilion. This river is rapid. After leaving Fort Smith, the Great Slave River is a superb river for navigation.

9th Question:—A. The Liard River near its mouth has several rapids, a little shallow, which are an obstruction to navigation of steamers. I believe flat steamers, somewhat powerful, could ascend these rapids; once above these rapids you have a magnificent river, the current of which is not too rapid, but passably swift nevertheless, and steamers could ascend it with ease and ascend also the south branch of the river. I have explored this river as far as Fort Nelson. It is very beautiful. Farther up than Fort Nelson I know nothing of the river.

10th Question:—The Peace River is a splendid river for navigation though it has a fall below Fort Vermillion. The steamer "Graham" ascends that far. I believe that it would be very easy to remove the rocks near the left bank. The fall there is inconsiderable. Below that fall the river is perfectly navigable for steamers—a little shallow, but navigable I should say to Fort Hudson's Hope, at the foot of the Rocky Mountains and also across the Rocky Mountains. On the other side of the mountains and also across the Rocky Mountains barques navigate the river.

11th Question:—Beaver River is a rather small and bad river. It has several shallow rapids, but it is navigable with small barques. That was one of the routes of the Hudson Bay Company, and I ascended that river during the summer of 1886 in the barques of that company. I do not know anything of the River Churchill of my own knowledge; but I have often been told that it is full of rapids. I have never visited that country myself, but I know that there are numerous lakes there, as in all parts of the country east of the Mackenzie River to Hudson Bay.

12th Question:—A. The Mackenzie is the finest river in the world for its length, its depth and also its navigation in summer. Steamers leaving Fort Smith cross the Great Slave Lake and can descend as far as the Arctic Sea. They can also ascend Peel River. The Mackenzie, which I have travelled upon very frequently, is a good deal larger than the St. Lawrence in depth and in the volume of its water.

13th Question:—A. Athabasca Lake is a magnificent lake and very suitable for navigation for all kinds of steamers. The lake being very large naturally it would

require steamers drawing a considerable depth of water to make the most of the navigation. The land about the lake is very poor for vegetation. The north and north-east shores are rocky or covered with boulders. The south and south-west shores are sandy. The lake is full of fish—the whitefish and trout of several kinds, the pike, and carp, etc., etc.

14th Question:—A. Great Slave Lake is a very large and fine lake, very well suited for navigation. The north and north-east parts of it are filled with myriads of islands—there are millions of them. There are several immense bays running very far into the interior of the country and nearly every part of the lake and the bays can be visited by steamers. Fish are in great abundance. The Great Slave Lake in addition to the fish which are to be found in Lake Athabasca possesses besides a species of very fine fish called the *Iacowu*. This fish is a species of salmon. It comes up from the sea and its further ascent is blocked by the falls of rapids at Fort Smith. At the west end of the lake there are abundant sulphur springs. In summer or in winter whenever one passes that way and the wind comes from the land he finds himself troubled with a strong odour of sulphur. Reindeer abound generally in the part of the country north and north-east of the lake. In the country lying to the south and west of the lake there is a good deal of forest of beautiful coppice wood, ordinarily spruce, and black or red spruce.

15th Question:—A. I have not been at Great Bear Lake but from reports of Fathers Petitot, O.M.I., and Ducot, O.M.I., the lake is immense and abounding in fish. There is an abundance of a small fish which I believe to be herring. The vegetation in those parts is miserable.

16th Question:—A. Along the Mackenzie River, separated by a chain of mountains, running in the same direction as the great river a succession of beautiful and magnificent great lakes, full of fish, are found. We have named them Pius the IX, Demazenod and Taché. These are the three largest lakes. I crossed them in winter from Fort Good Hope to Fort Norman which is near the mouth of Bear Lake River, which discharged the waters of the lake of the same name. That river is navigable for barques a little flat. Its current is enough to make one giddy. The lake also would be navigable but it is not for any length of time free from ice.

17th Question:—I have always said that the Arctic Sea was nearly always frozen or covered with icebergs, and the navigation there was very difficult, though I know that whalers have been very near it, that is to say as far as Point Barrow, after passing through the Behring Straits. It is said that at the mouth of the Mackenzie and for a distance into the sea there are a good many banks of sand and that the channels are very sinuous. I have been told several times that vessels are not able to come by sea, and reach also the mouth of the Mackenzie, but it is possible that these reports have been made by persons or by companies who were interested in preventing that country from being opened up.

18th Question:—A. Since the summer of 1885, the steamer "Graham" has been running from the lower part of the River Athabasca to the mouth of the Clearwater at the landing. It goes also to the end of Lake Athabasca and ascends the Peace River as far as the falls. The little steamer "Wrigley," drawing four feet of water, sails on the Great Slave River, Great Slave Lake, Mackenzie River and Peel River. I am told on good authority that last summer they intended to build a new steamer for the upper Athabasca River, and that between Grand Rapids and Fort McMurray to Clearwater they would continue to use barques.

20th Question:—A. The map of Rev. Father Petitot can give you the names of the principal lakes between the coast of Hudson Bay and the Mackenzie River. They are very numerous and very full of fish.

21st Question:—Generally the climate of the Mackenzie River basin is dry; also they have very little rain in summer. It is also generally a little too dry for crops. Generally at the end of our long winters we have not more than two feet or two and a half feet of snow.

22nd Question:—A. I do not know if they have ever dug deep into the earth to ascertain the distance to which the frost penetrates. At the polar circle I believe

that it penetrates twenty feet in depth, judging by the thickness of the ice on Great Bear Lake, which attains a depth of eight to nine feet. I judge also from the islands or the sandy bank or the alluvial lands by which I have passed. The Mackenzie in the spring works under the frozen land, and I think I can say that there is a depth of frozen soil of about twenty feet. The Great Slave Lake freezes from six to seven feet in depth, and the Athabasca Lake, in the neighborhood of the mission four feet.

24th Question:—A. At Ottawa before the committee, I shall be able to indicate on a map the portions of the country referred to under this head.

25th Question:—A. I know very little of the barren grounds except that they are covered with lichen, the food of the reindeer during the summer season. It is there that they bring forth their young. In these barren grounds there is a great abundance of white partridges or ptarmigans. They pass the summer there amongst the reindeers. During the winter or about the approach of the winter they take to the wood country and the reindeer follow them sometime afterwards.

26th Question:—A. The barley shoots and ripens at Fort Norman at the mouth of Great Bear Lake River. Consequently it grows at Fort Wrigley or Fort Simpson, and at Fort Providence. In the Liard River and Peace River countries it succeeds also very well. Our Brother Kearney and the Hudson Bay Company have grown potatoes at Fort Good Hope (Polar Circle), at our mission at Providence, and at all our missions on the Mackenzie River, the Liard River, the Peace River and the Slave River, &c., potatoes and other vegetables are cultivated very successfully.

27th Question:—A. Wheat grows at Providence Mission, at Fort Simpson; but it rarely arrives at perfect maturity. It ripens much better on the borders of the Liard River and the Peace River. At the Mission of the Nativity (Fort Chippewyan at Lake Athabasca) we have often grown fine wheat.

29th Question:—A. At the Mission of the Nativity (Athabasca) at Fort Resolution (Great Slave Lake) at Fort Smith, at the Mission of Fort Providence, we sow from the time the land begins to thaw, that is to say from the 15th May until the 8th or 10th June. At Good Hope, that is at the commencement, we begin at the beginning of June. Throughout the length of the Liard River and the Peace, sowing begins a little earlier. At the end of August we have already harvested barley and wheat, as cut from the 15th to the 25th September.

30th Question:—A. Flowering shrubs and flowers flourish a short time after the snow disappears. Plants which are deeper in the ground, such as potatoes, take a good deal of time to spring up because of the ground being frozen below, but those which are near the surface of the ground commence to grow very soon and the nearer one approaches the north, for example the Polar Circle, the more rapidly does the vegetation begin, because of the greater length of the days, or the days being without nights. In 1886 I observed the matter at Good Hope. Towards the 7th or 8th June vegetation commences and in five or six days the leaves of the trees had reached their natural size. It is because then it commences to be warm, and very warm, and that continues, save when sometimes north winds, which bring back the snow and cold and sometimes injure the crops.

33rd Question:—A. Generally we harvest our potatoes from the 20th to the 30th September. Turnips, carrots, beets, &c., we harvest a little later. Wheat on the banks of the Peace River and Liard River is ripe towards the end of August. At Athabasca and at Providence from the 15th to the 25th September. Barley is ripe a little later and a little sooner throughout. Rye does not ripen any sooner than wheat, but I have not made many experiments, for the reason that we like wheat better than rye. Oats we harvest at the same time as wheat, but we have only sowed it once. Potatoes we harvest at Athabasca and at Providence from the 20th to the 30th September. Turnips, carrots, beets, radishes, &c., we harvest later. Indian corn generally cannot get ripened below Athabasca or on the Mackenzie. Strawberries commence to ripen towards the 15th July; gooseberries ripen towards the end of August, and at the commencement of September. Raspberries and currants come after the strawberries. There are also in places a good deal of blueberries, cranberries and other small fruits, such as *poires sauvage* (saskatoon) &c., &c.

33rd Question:—The months of June, July and August are generally very warm, but there is not sufficient rain. The drought injures crops. If we could have during these months two or three good rains the harvest would be good, that is if the rain should not bring cold as it sometimes does and as I have observed it.

34th Question:—A. Yes, during these three months of summer we have sometimes white frosts, which sometimes do a good deal of damage to the crops.

35th Question:—A. If the north wind blows with violence for two, three or four days these frosts are sometimes general. After these north winds if there is a calm and we have a clear sky frosts are certain. If the north wind is not very strong the frosts are but local.

36th Question:—A. It is certain that if this country becomes settled and cultivated on a large scale frosts will be much less frequent. That is the result which we have already observed at our principal posts: the more we clear any extent the less are fields susceptible to frost.

37th Question:—A. Rains do not commence until towards the end of July, but as I have already said above generally we have but few rains.

38th Question:—A. The months of September and October are generally dry and the blue sky makes them charming. In general we have a clear sky without a cloud and in winter and in summer that is what makes the climate so healthy. In the basin of the Mackenzie, and if we had a sufficiently large quantity of provisions, people could live there to a greater age than in any other part of the globe.

39th Question:—A. We have not remarked that the intensity of the frost has any effect on the natural trees of the country.

40th Question:—A. In several places in the basin of the Mackenzie there are a great number of natural prairies, those with round hay and those with flat hay. The round hay in certain places grows from three to five feet in height. The flat hay is also very fine, but a little shorter. It grows everywhere in the low and wet places.

41st Question:—A. I have observed a good deal of wild pease in the neighborhood of Lac la Biche. There is also some at Athabasca and along the Peace River.

43rd Question.—A. About Little Slave Lake which I have visited the soil appears to be excellent, and the soil along the road between Little Slave Lake and the mouth of Smoking River is also of a superior quality. On the borders of the Peace River and the Liard River there are a good many magnificent sections of good alluvial lands. At the Providence Mission, my residence, there is an excellent clay, which is very good for cultivation. Throughout the country in general we find all sorts of land, black soil, loam, clay, sand, marl, &c., &c.

44th Question.—A. It is difficult to say the extent of country fit for pasturage, and the cultivation of cereals or other plants. In certain sections, such as Vermilion and Athabasca (Fort Chippewyan), at Providence, &c., there are very large natural prairies. I am unable to say the extent of these cultivable lands, for the reason that their cultivation has not been tried, except by the missionaries, and a little by the Hudson Bay Company.

45th Question.—A. The climate in general is very rigorous in winter. It becomes extremely cold, but at the return of spring it is very warm, and the days being very long, the plants thrive very quickly. In planting strange plants, those which are most hardy and which grow most quickly should be chosen.

46th Question.—A. At Providence Mission and at Fort Simpson the grasshoppers have done much damage to plants for four or five years. They have had them there for two years at a time, for their eggs do not hatch until the second year after they have been deposited in the earth. At the Mission of the Nativity (Athabasca) blackbirds have done us damage, but if cultivation were better spread the scourge would not be further felt. So long as there are but a few little fields in a great country it is not astonishing that the crops should be damaged by the birds.

47th Question.—A. At the mission of Good Hope the Rev. Father Séguin, O. M. I., has a record of the degrees of temperature at Good Hope for 28 years. In the basin of the Rivers Athabasca, Clearwater, Peace and Liard I believe that if those countries were colonized, the white frosts which occur there sometimes during the

summer would become more rare, and the settlers would be well able to live there if means of communication were furnished them. I repeat the temperature is very rigorous in winter, but in summer it becomes very warm, and plants grow rapidly. At the end of this document I adjoin a sheet showing the degrees of frost in winter at Good Hope.

48th Question.—A. The great lakes and the great rivers exercise in effect a great influence to prevent white frosts in summer, and to delay the frosts in autumn. We have observed that it is only about the lakes and along the great rivers that the crops and the harvests ripen. In the interior of the country the white frosts are a good deal more frequent. So long as the country is not cleared and colonized it is useless to sow seed far from the lakes and rivers. The rivers of the basin of the Mackenzie, having in general a strong current, become frozen relatively late and the ice breaks up relatively earlier also. The Rivers Athabasca, Peace and Liard begin to lose the ice during the month of May. The Mackenzie is free from ice at the end of May. The ice only takes on the large rivers in October, and the Great Athabasca Lake until towards the end of October, and the Great Slave Lake, being much larger in extent, does not close until much later than Athabasca Lake. The ice disappears in the latter between the 10th and 20th June; on the Great Slave Lake between the 15th and 30th June. In a voyage which I took from Fort Rae to Fort Resolution I was not obliged to leave the ice until the 3rd July. I am unable to speak of the Great Bear Lake. It remains just a month clear of ice. The Mackenzie River between Fort Simpson and Fort Good Hope is free from ice in the latter part of May.

49th Question:—A. The most frequent winds are those from the east and west, in winter especially. The winds from the west and south are good for the crops. That from the north is always cold. Even in summer if the north wind blows a little strong for two or three days it brings sometimes snow or white frost. The mid-day wind and the south wind are the warmest in the summer season.

50th Question:—A. At the Polar Circle this wind often makes its effect felt even in winter. The Rev. Father Séguin and Brother Kearney, who have been at Good Hope for 28 years, have observed its effect. I have observed it also myself during the winters of 1885 and 1886. This wind modifies the temperature a good deal.

51st Question:—A. At Lac la Biche the missionaries having set the example of cultivation, as they have done nearly everywhere throughout the rest of the Mackenzie Valley, there are now good farms all around the lake. On the Peace River at Dunvegan, at Vermillion, the missionaries have fine farms, which give excellent results. At the Catholic Mission of the Nativity, at Athabasca, they grow potatoes, barley, wheat, turnips, carrots, beets and other vegetables. At Forts Smith, Resolution, Providence, Simpson, des Liards, Nelson, Wrigley, cultivation has given good results. At Providence Mission, my residence, one year I had 1,440 barrels of potatoes—one barrel 10 gallons—but this was a very favorable year, we had been greatly favored by the heat and by rain at opportune times. On two or three occasions we have had a thousand and twelve hundred barrels of the same roots.

52nd Question:—A. My information is that no species of domestic animal can exist in the barren grounds, because it is too cold there.

53rd Question:—A. The Indians not being provident, above all since they have got guns, by unnecessary slaughter, sometimes with their guns and sometimes with their lances or darts, have diminished a great deal the number of animals, concerning which you ask for information. There are the cariboo, or reindeer, which are still the most numerous. These cariboo live generally in the mountains or barren grounds in summer, and the country abounding in lichens. Their resort extends from the Mackenzie to the Arctic Sea and the Hudson Bay. Besides, opposite Forts Wrigley, Norman and Good Hope, there are some in the Rocky Mountains to the west of that river. The reindeer live generally in large herds. The red deer, on the contrary, live alone or in very small bands. The latter live in the wooded country. The musk ox dwell on the steppes to the east of Lake Athabasca, Great Slave Lake, and Bear Lake. The finished furs of certain species of the cariboo are soft, fine and

highly prized. The wood buffalo have become very rare. There are only a few in the neighborhood of the Salt River. The males weigh about 1,000 pounds. The moose have become more rare, but are still found in very large numbers. The moose of the Mackenzie regions have beautiful fur. They have in general fur with the most beautiful hair. Their prepared skins are also very soft, heavy and highly prized. They live on grass, hay, and in winter they browse on the trees, the willow and the birch are preferred. The reindeer in summer eat hay, in winter they scrape the snow with their hoofs to uncover the moss, the lichen and the hay. It is the lichen that is their favorite food. I do not understand very well the English expression elk (*elan*). I have been accustomed to call the moose "*elan*" though it may be that the animal I have described as *la Biche* is the animal which is designated as the elk. In our northern regions we call *la Biche*, the males or the females, a species of deer. There are very few there: They are yet seen along the River Athabasca above the Clearwater. In my travels I have twice seen this animal, and it is a little smaller than the moose. As to domestic animals, these are the dogs who play a great role in the Mackenzie basin; serving the whites and the Indians for their journeys in the winter. We have also introduced horses and cows. As yet horses have not passed the Great Slave Lake, but cattle have been taken as far north as Fort Good Hope. They are found at the principal establishments of the missionaries and the forts of the Hudson Bay Company.

54th Question:—A. All the small fur-bearing animals mentioned in this question are yet very numerous in the basin of the Mackenzie. Generally their furs are very beautiful and highly prized. The further we go to the north the more beautiful the furs become. The lynx is caught by snares. The different species of fox are caught generally by means of a steel trap. These small animals mentioned are found nearly everywhere in the vast regions of the north. The fisher and the marten are generally taken by means of wooden or steel traps. The wolverine is the enemy of the country and of the poor Indians, because he destroys the wooden traps intended for the fisher, marten and lynx and without getting caught himself. He is the most cunning animal that I know, and he has unparalleled malicious instincts. The ermine abound in certain sections but I do not know at present the most favorite way of capturing them. The musk-rat in certain years swarm. I have no particulars concerning the polar bear. The grizzly bear is principally found in the Rocky Mountains or their vicinity. He is ferocious and the Indians do not voluntarily attack him, for fear of being torn up by him. The black bear is the most abundant. There are a good many of the latter along the Peace, Athabasca and Liard Rivers, and a few throughout the country. The brown bear is less abundant, but his fur is very superior.

55th Question:—A. I cannot reply to this question. I have no exact information to give. Address some of the members of the Hudson Bay Company for information.

57th Question:—A. I should begin by stating that the lakes are innumerable in the basin of the Great Mackenzie, and that nearly all of them abound in fish of different kinds. The regions east, north-east, and north, above all abound in lakes of all sizes, and are very rich in fish. Lake Athabasca furnishes a very great quantity of whitefish, of small and large salmon trout, of pike, of pickerel, of carp, of large loches, &c., &c. The whitefish weighs at least three pounds; the small trout from four to ten; the large trout from 10 to 35 pounds; the pike from 4 to 20 pounds; the carp the same. In Clear Lake pike are caught weighing from 25 to 35 pounds. Whitefish, pike, pickerel, carp and trout, are caught in nets in which the meshes are four and a half to five inches in size. The pike and trout are taken altogether with hooks. Nets are set in summer, in winter or at any time. When the ice is four or five feet thick they make holes in places and set lines under the ice, and the same in most of the lakes, as necessity may require. During thirty years that I have been in the country I do not believe that the fish have diminished at all. The population being so sparse and the lakes and the rivers being so numerous, the fish increase more quickly than they can be caught. I regard as certain that the

general Government of Canada can derive a good deal of profit from the fisheries in the basin of the Mackenzie. These will be a resource almost incalculable. The Great Slave Lake produces the same species of fish that the Great Athabasca Lake does, and also in much greater quantity. They find there, besides, also the *Inconnu*, a species of salmon which comes from the Arctic Ocean. It is undeniable that it comes from the sea. It is found all the way up the Mackenzie as far north as the river at Fort Smith. There the rapids and the cascades prevent it ascending higher. It is a beautiful and fine fish—the shape of the whitefish but much larger. It weighs from 8 to 30 pounds.

58th Question:—A. I have been told by the Rev. Father Séguin, who has travelled to the Arctic Ocean for the evangelization of the Esquimaux, that the Polar Sea is exceedingly rich in sea cows, sea wolves, &c., &c. The Esquimaux have different species of arrows, darts and harpoons for the chase in their kayacks and oomicks.

59th Question:—A. If it is impossible to reach the mouth of the Mackenzie by sea from the north, and it is desirable to explore the great fisheries, whether they be those of the interior or those on the north side of the Mackenzie, it seems to me that it would be necessary to make a railway which would go to the Peace River, or better still, to Fort Smith. The steamers could be built near Fort Smith, as they have built the "Wrigley," and these steamers could furrow the immense Great Slave Lake and go to the depths of all its great bays, and finally descend the majestic Mackenzie and fish on the banks.

60th Question:—A. Along the Great Slave River and Fort Smith to Fort Resolution there is a great quantity of beautiful forest, white spruce or ordinary larch. Spruce from two to three feet in diameter are found. Along the Liard River and its southern branches, taller and larger spruce may be found.

62nd Question:—A. Before the Committee I will be able to indicate much more readily the wooded country, but I may say that all the basin of the Mackenzie is in general wooded. It is only on the banks and in the east and north that the country lacks forest, in the barren grounds. In the basin of the Mackenzie the most abundant wood, at least the most useful, is the spruce. It occurs throughout along the rivers and about the lakes and in the interior of the country. There are also a good many larch or red spruce. The aspen and the poplar are very abundant, as also is the birch. The birch of the country is very hard, and would make good furniture. It is from the birch that they make traineaux, buggies, chairs and snowshoes.

63rd Question:—A. Not being a naturalist I cannot reply to this question, but there is no doubt that the naturalist will find a good deal there.

64th Question:—A. I may say the same thing in reply to this as to the preceding question. I may mention nevertheless wormwood and the black currant. The black currants are very abundant in the wet grounds.

65th Question:—A. I suppose you wish me to speak here of what is called in that country swamp tea. This plant is found nearly throughout the whole country west of the River Athabasca, the Rockies, the Great Slave Lake and the Mackenzie River. It is very abundant. The Indians use it sometimes to make tea. Our fathers at Good Hope use the flowers of this plant to make tea. The flowers mixed in small quantities with tea gives it an exquisite perfume. I have drank it several times myself.

66th Question:—A. I think that maybe the leaves or the flowers of this plant mixed with Asiatic tea would yield a revenue.

67th Question:—A. There is gold in the sand banks of the Peace River and in considerable quantities, but during the winter and in high water it cannot be mined. The miners make there from \$15 to \$20 per day. There is copper and one river bears the name of Coppermine River. It is found there in great pieces. I have seen little crosses made of it by the savages themselves when they were not able to have other metal. The sulphur abounds in several places. I have seen it on the Clearwater River and above all on the west bank of the Great Slave Lake. It is there in such quantities that the odor is annoying to those who pass by. Near

Fort Smith there is a salt mine which is probably the most beautiful and the most abundant in the universe. There is there a veritable mountain of salt. By digging a little in the earth, from six inches to a foot, rock salt can be found there. In addition to that there are salt springs, where during the winter the salt runs from these springs and forms little hills of salt. You have only to shovel and you can gather a fine salt, pure and clean. On the borders of the Peace River stones are found which are sufficiently precious to make rings of them. I have seen gypsum along the Mackenzie and a little below Fort Norman.

68th Question :—A. At the Mission of the Nativity, Athabasca, there is excellent clay, as also at the Providence Mission (the Mackenzie). One of the Brothers has made bricks of it and Mr. Farand once tried to make pipes at Athabasca, and if he had had moulds he would have been very successful, and there is a great quantity of limestone on the *Rivière des Rochers* on the banks of Lake Clear; islands in very great numbers on the Great Slave Lake contain nothing but calcareous rocks. The mountain where Fort Rae is built, and our Mission of St. Michel (the same place) is all built of limestone. You find limestone all along the Mackenzie River. Granite is very abundant throughout.

69th Question :—A. We have noted here and there a good many springs—warm springs in winter, of which the water is glacial in summer; I am not in a position to pronounce as to the properties of these waters.

70th Question :—A. The mouths of the Athabasca, Peace, Salt and Great Slave Lake Rivers are places where the imperial birds (outardes) the grey goose, and the white goose, large and small, and the swan, prefer to stop to fatten themselves. They are there in such numbers sometimes in the spring and the autumn that you can hardly sleep when you camp near them. This is particularly so in the west part of Lake Athabasca and in the meadows and level places in the neighborhood and on the borders of Lake Clear, where these fowl are abundant, as well as ducks of all kinds. These fowl remain there nearly six weeks each spring and as long in the autumn. The ducks pass all summer there.

71st Question :—A. The outardes, the grey goose, white goose (large and small) swans, ducks of numerous species and varieties are of great value there and constitute the greater part of our food in the spring and the fall. These fowl are very numerous. The number of them is incalculable.

72th Question :—A. In reply to number 70 I have already mentioned some places where these fowl stop, but I might also mention the Mackenzie River where it leaves Great Slave Lake. Little Lake, a few miles from our Mission Providence, Salt River Mouth, and the mouth or the confluence of the Hare Skin River, Arctic circle, and in fact on the shores of Hudson Bay and the Arctic Sea these fowl pass the summer.

73rd Question :—A. These geese and outardes live on the sand banks or the gravel beds along the rivers, and about the lakes and in the submerged prairies, or prairies which have been submerged. When these fowl reach us either from the north or south they are thin, but after fifteen days they commence to be very fat and before their departure they are still more so.

74th Question :—A. I cannot remember exactly when the birds reach us in the spring. The swans arrive first and are the last to leave us. The outardes, geese and ducks reach us in the spring from the 8th to the 15th April. They return afterwards just before the ice takes in, the first weeks of October. Naturally they arrive a little later at the north and in returning are from 8 to 15 days later.

75th Question :—A. I have no remark to make on this question.

76th Question :—A. In the neighborhood of Lac la Biche, and on the shores of Peace River, and for a distance through these territories and in parts, there is an abundance of *petit poire* (saskatoon) and of choke cherries. The *petit poire* are found also in the Athabasca country (on the shores of the lake and on the islands), and along the Mackenzie River, at least to Fort Simpson. They are also abundant on the south branch of the River des Liards and some at the confluence of the two rivers, just at Fort Simpson. Strawberries, raspberries, gooseberries, currants and black

ourrants are in great quantities in places throughout. The cranberries literally cover the earth in a good many places. They are very abundant in the poor lands—marshes and sandy lands amongst the little balsams and spruces or where the pines grow, that are called “cyprus” in many parts.

TEMPERATURE at Good Hope (Arctic Circle) on the Mackenzie River, indicated by a centigrade thermometer, during the months of October, 1885, to 4th June, 1886.

Day of Month.	October.	November.	December.	January.	February.	March.	April.	May.	June.
	Deg. of cold.	Deg. of cold.	Deg. of cold.	Deg. of cold.	Deg. of cold.	Deg. of cold.	Deg. of cold.	Deg. of cold.	Deg. of heat, taken at 3 p.m.
1	2	10	23	46	50	20	12	11	28
2	1	7	19	45	48	30	14	5	29
3	2	15	18	39	49	35	20	11	37
4	4	13	17	43	39	25	26	14	21
5	8	18	13	46	43	28	17		
6	4	20	21	46	35	20	24	15	
7	7	25	14	30	33	22	20	10	
8	4	26	24	24	40	30	24	5	
9	4	24	27	23	44	31	15	6	
10	10	27	18	27	52	45½	14	8	
11	7	24	21	18	47	35	8	6	
12	4	23	22	30	41	39	9	18	
13	11	26	32	37	50	40		19	
14	4	33	27	35	40	35	14	9	
15	4	27	28	33	32	42	9	7	
16	3	16	32	22	28	40	11	2	
17	12	24	33	33	28	37	13	9	
18	8	27	31	27	41	35	12	8	
19	7	26	28	40	39	33	15	1	
20	9	18	44	44	41	33	18	+ 4	
21	4	29	44½	28	27	30½	16	+ 5	
22	6	30	44	5°	44	28	17	+ 3	
23	12	27	40	25	42	27	15	0	
24	27	26	26	28	44	27	11	+ 1	at 3 p.m.
25	15	34	24	30	32	34	14	+ 6	22
26	20	29	35	39	27	28	16	+ 7	22½
27	22	30	26	38	28	14	13	+ 5	20
28	18	27	28	41	32	4	12	+ 5	20
29	14	24	38	45	24	6	11	+ 6	23
30	12	27	45½	44		9			
31	11		47	49		15		+ 10	26

* West wind.

For the Month of January, 1887.

Days of Month.	Degrees of Cold.
1.....	36
2.....	42
3.....	44
4.....	44½
5.....	41
6.....	32
7.....	24
8.....	18
9.....	16
10.....	24
11.....	32
12.....	34

Days of Month.	Degrees of Cold.
13.....	33
14.....	35
15.....	31
16.....	28
17.....	39
18.....	42
19.....	46
20.....	48
21.....	53
22.....	48
23.....	41
24.....	46
25.....	39
26.....	37
27.....	44
28.....	52½
29.....	53
30.....	51
31.....	41

N.B. The degrees of cold were observed at 6.30 a.m., but I should remark that from the first of November to the 11th January, the time during which the sun does not rise at Good Hope, the temperature is about the same at midday as at midnight.

2nd. Rev. Father John Seguin entered in a note book all the degrees of temperature during 27 or 28 years. If the Senate wish to have them I can ask the Father for them, but as it would be a long job to copy the whole of them, I suppose that the good Father, who is very poor, would like to receive some recompense for his trouble.

3rd. I have not kept account myself of the degrees of heat in summer, but I am able to say that it is excessively hot; and the further one goes towards the north the warmer one finds it becoming; and that heat lasts the 24 hours of the day without sensibly diminishing in its intensity from 10 p.m. to 3 a.m.

ISIDORE CLUT, O.M.I.,

Bishop of Arindele.

17th April, 1888.

The following information was sent by Frank Oliver, Esq., of Edmonton, editor of the *Edmonton Bulletin*, to the chairman of the Natural Food Product Committee of last session, but received too late for insertion in Report:—

The following information has chiefly been acquired from Murdock McLeod, of Edmonton, who spent the years '62, '63 and part of '64 in the Hudson Bay Company service at Fort Anderson, since abandoned, east of the Mackenzie and about eighty miles up the Anderson River from the Arctic coast. In the summer of '63 he accompanied an expedition undertaken on behalf of the Smithsonian Institute, along the Arctic coast from the mouth of the Mackenzie to that of Coppermine River. In '65 he was at Fort Liard.

The muskox is the chief inhabitant of the barren grounds which occupy the immense triangle north-eastward of the Mackenzie basin to the shores of Hudson Bay and the Arctic Ocean. The animal is very similar to the buffalo in size and shape, but fur is finer and longer, almost dragging to the ground; the horns are of somewhat different shape, and the boss or hump over the shoulder is nearly two feet high, and the flesh has a disagreeable musky flavor, especially from December to February. The Indian does not kill them for food unless there is no deer. A bull which Mr. McLeod helped to kill weighed 1,400 pounds dressed, and the robe measured 15 feet from nose to rump. They are found generally in bands of ten to

forty. In summer they range on the barren grounds and in winter come into the northern edge of the woods. They live on the moss which covers the barren grounds and are able to root it from under three feet of snow. Some winters they are scarcer than others, but why is not explained. Whether they have merely changed their wintering place or have really lessened in numbers. The barren grounds on which they roam are vast hilly plains of clayey soil, honeycombed on the surface in a remarkable manner, and overgrown by an Arctic moss of a creeping variety. There are no shrubs, willows, grass or other vegetable growth, except the moss, which furnishes the food of both the musk-ox and the jumping deer. The jumping deer, sometimes erroneously called the reindeer, are the principal food of the Indians and Esquimaux who inhabit the outskirts of the barren grounds. They are a small deer, of a dim color, with branching horns; a large one would dress perhaps 100 pounds. They are found in herds of thousands and range in the barren grounds in the summer, seeking the edge of the forest in the winter. They are killed chiefly while crossing streams or the narrows of lakes in their migrations by men in canoes armed with spears. They are not found very far south of the northern limit of the forest. Some seasons they are scarce, as well as the musk-ox, but why is not known.

The moose, too well known to need description, is found all over the forest region to the edge of but not going into the barren grounds. They are most plentiful in the hard region west of the Mackenzie. They go in small herds of six or a dozen and weigh from 600 to 1,000 pounds of dressed meat.

The elk, also well known, ranges in the same country as the moose, but not quite so far north or east. The hard region is probably the northern limit of the elk country, and they are chiefly found near the mountains.

The wood buffalo exists in small numbers in the open country between the Lower Peace and Great Slave Lake Rivers extending westward from Great Slave River about Salt River, in latitude 60, and also between the Peace and the Athabasca. They are larger than the prairie buffalo and the fur is darker; but practically they are the same animal. The herds are doubtless small, and it is probable that the Indians do not carry on an indiscriminate slaughter against them, but some buffalo meat is brought in every winter to the Hudson Bay ports, nearest the buffalo ranges. Mr. McLeod says that in the winter of 1865 he helped to kill a large buffalo bull on the Nahanni Mountains west of Fort McLeod, but it seemed that he must have wandered from some other part of the country or the Indians in that locality did not know what it was and were afraid of him. He was killed in February and was in splendid condition.

Bears, black, brown and grizzly are found as far north as the woods extend, but are not numerous along the Rocky Mountains, in the Peace and Liard River regions where they constitute an important item of the Indians' food supply, especially in Peace River. This is proof of the abundance of berries there.

The beaver is also found all over the wooded country, but is not plentiful in the very far north; and on north-east near the barren grounds; it is also important as an article of food.

The rabbit is, of course, found all over the wooded country, and is subject to phenomenal increase and to phenomenal scarcity. Year after year they increase until the country is fairly overrun with them. The Indians can live well enough in rich years, for even blind men can kill enough for themselves. The lynx which live on the rabbits and which the Indians eat, as well as all the meat-eating fur-bearing animals, increase greatly during rabbit years. Therefore when rabbits are numerous the Indians have during the winter comparative abundance. Then the rabbits decrease unaccountably, more rapidly than they increase. One great supply of winter food is cut off from the Indians themselves and from the fur-bearing animals as well, which soon become scarce, either through migration or death, consequently when rabbits are scarce times are doubly hard with the Indians. Sometimes an abundance of deer makes up for a scarcity of rabbits, but occasionally both deer and rabbits are scarce; then the Indians starve.

Water-fowl are plentiful beyond conception in the northern lakes of the Mackenzie Lakes and on the Arctic coast in the summer season, and furnish abundance of food to the Indians while they remain.

Fish abound in all the lakes of running water, and the fisheries of Lake Athabasca, Lake Slave and Great Bear Lake are at least as valuable as those of the St. Lawrence chain, while thousands of smaller lakes, especially east of the Mackenzie, are stocked with fish as well. The available fish supply alone is more than sufficient to supply ten times the present population of the Mackenzie region.

Berries of various kinds are the only considerable natural food product of the Mackenzie River country. They are plentiful in their season throughout the whole of the wooded region which extends to within 100 miles of the Arctic coast.

The blueberry is the most plentiful and is found throughout the whole region, it resembles the huckleberry of the east; the blackberry and morsberry come next in quantity in the far north. The former is not the blackberry of Ontario, and the latter somewhat resembles the strawberry. From the Liard River south to the Saskatchewan, the raspberry, strawberry, Saskatoonberry, gooseberry, high and low bush cranberry, chokeberry, and black and red currant flourish, as well, besides numerous minor varieties of berries. The Peace River country is especially noted for its abundant supply of berries of excellent quality.

Although berries of all the kinds mentioned are plentiful in the upper Saskatchewan, Indians used formerly to travel to Peace River some 250 miles to avail themselves of the supply there. In some years they are much more plentiful than in others, in plentiful years they form an important item of the Indians' food. There is every reason to believe that the varieties found here which are cultivated profitably in other countries could be as satisfactorily cultivated here, at least from the 61st parallel southward between the main streams of the Mackenzie and the Rocky Mountains.

The very large number of bears found in this region, particularly in Peace River, is the best possible proof of the abundance of berries. Possibly the wild turnip and carrot are found in Peace River as well as in the Saskatchewan, but they do not in their present state furnish any appreciable supply of food to the natives.

A word regarding cultivated food products may not be out of place. Successive years of experiment have demonstrated the practicability of the growth of wheat, barley, oats and potatoes, at Dunvegan, Vermillion and Chippewyan, the two latter in latitude 58½. Mr. Murdock McLeod, at present a resident of Edmonton Settlement, states that in the summer of 1865, while in the Hudson Bay employ, at Fort Liard, latitude 59½, he sowed about three acres of wheat on 26th of May, this was in the stock on August 1st, it was good grain, though somewhat smutty and had not been frosted; barley sowed at the same time did equally well, also potatoes.

During several summers' residence at Fort Liard he never saw summer frost; he also states that at Fort Simpson, in latitude 62½, wheat, barley, potatoes have done well. This is borne out by the statement of Rev. Mr. Spendlove, missionary at Fort Simpson, except that in 1887 the barley was frosted. Captain Smith who built and sailed the Hudson Bay steamers "Graham" and "Wrigley" and sailed the latter to within 100 miles of the Arctic Ocean in 1887, states that at Salt River, latitude 61½, are small settlements of halfbreeds, who have horses and cattle and grow barley, wheat and potatoes; he saw potatoes and barley growing as far north as Fort Good Hope, on the Mackenzie, north of the Arctic Circle.

The following letter was received from Mr. Donald Ross, to be forwarded to the Chairman of last year's Food Committee:

1st. I have travelled most of the northern part of British Columbia to the headwaters of Peace River, and through the Rocky Mountains on that river to its junction with Smoky River by way of Lesser Slave Lake and Old Fort Assiniboine to Edmonton and down the Saskatchewan River to Lake Winnipeg. I have been a

resident of Edmonton for over fifteen years and am partially familiar with nearly the whole North-West.

Birds.—Mr. Moberly's list with addition of pigeons which are sometimes caught with nets in this vicinity, and further east by the score. Blackbirds are also very thick at certain times.

Fish.—In addition to Mr. Moberly's list there is the chub in Peace River and its tributaries and in the British Columbia streams.

The unknown fish, a kind of chub, in the lakes and streams around Fraser Lake, British Columbia. These fish are full of bones and have their ribs just underneath the skin, very tenacious of life, as they will jump out of the hot pan after having been dressed and their head cut off.

Ling or loche, a species of cat-fish, very voracious, all rivers and lakes in British Columbia and North-West, more especially the Mackenzie River where it forms quite an item in the food supply of that district.

The Arctic or blue trout.—This is a very nice shaped fish, with no resemblance to a trout; will average a little over a pound in weight. A mouth like a whitefish and will not take bait—in rivers and streams flowing into the Arctic.

Animals.—Mr. Moberly's list with these comments and additions: The wood buffalo exists in the localities named; about 1870 one was killed as far west on Peace River as Fort Dunvegan. They are quite different from the prairie buffalo, being nearly double the size, as they will dress fully seven hundred pounds. Their fur is longer and finer than the common buffalo and more resembles that of the musk ox. They subsist on moss and brouse.

Both the large and small reindeer are found in the east of the Rocky Mountains in this latitude, the large size dressing three hundred pounds and over; and the small size about one hundred and twenty pounds.

Rabbits are very numerous at times in the North-West, but they periodically die out from a disease of the throat. I may say that the prairie chicken dies off similarly in periods of about seven years.

Lynx.—This is a very agreeably flavored flesh, resembling a chicken in texture and flavor.

Porcupine.—Rocky Mountains and vicinity; also in the woody parts of Alberta. Flesh superior to beaver.

Badger.—All over the North-West prairies.

Plants.—Lambs-quarter is found in all cultivated plots through this part of the North-West. It has a flavor nearly equal to spinach.

Wild Parsnip.—The young root of this plant is very good eating; the old roots are poisoned; the seed stalk, when young, resembles celery in flavor.

Birch.—The sap of this tree is used further north by the natives to make syrup of.

Whitefish is by much odds the best fish with which to stock and restock the smaller lakes of this part. Trout, pike and pickerel require other fish to feed upon, but will exist much better in streams than in lakes.

I have the honor to be, sir,

Your obedient servant,

DONALD ROSS.

The Honorable JOHN SCHULTZ,

Chairman of the Committee on the

Natural Food Products of the North-West, Ottawa.

OTTAWA, Thursday, 19th April, 1888.

The Committee met at 11 a.m.
The following letters were read:—

PORT ARTHUR, 15th April, 1888.

Mr. S. J. DAWSON, M.P., Ottawa.

MY DEAR SIR,—I notice that a Parliamentary Committee are making enquiries concerning the resources of the Great Mackenzie Basin. They cannot do better than to communicate with the Rev. J. B. N. Genin, Post Office Box 1236, Duluth, Minnesota. I have had some long conversations with him on that very subject, and some of his accounts are most interesting and marvellous. Father Genin has penetrated all the north and north-west of Canada as a missionary priest for 20 years. He made his way quite to the mouth of the Mackenzie River and stayed in that neighborhood for two years. He is educated, intelligent, discreet and observant, and I consider him quite reliable.

He will be here at Port Arthur in about three weeks from now.

Not being acquainted with any of the Committee, I venture to notify them through yourself, if you will have the kindness.

Yours respectfully,

EDWARD A. WILD.

BISHOP'S COURT, WINNIPEG, MANITOBA, 4th April, 1888.

DEAR DR. SCHULTZ,—I received what you sent me the other day, and this afternoon I received the questions from the Committee. I regret that I cannot be of any service to the Committee as I have never been in either the Athabasca or the Mackenzie River District, and have no definite information to give. I have replied to that effect.

* * * * *

With kindest regards,

I am faithfully yours,

R., RUPERT'S LAND.

Hon. J. SCHULTZ.

COLBORNE, ONT., 16th April, 1888.

DEAR DOCTOR SCHULTZ,—I duly received your esteemed favor of the 10th inst., accompanied by the list of questions referred to regarding the Mackenzie Basin.

As I never visited at any of the Hudson Bay Company stations in that region, nor in fact visited the locality in question, any information I might be able to give you would only be second hand, and, therefore, not reliable for the object in view.

Most of my time in the Hudson Bay service was spent in the Eastmain coast of the Hudson Bay, from Albany on the west coast to Fort George on the east coast.

I regret I cannot assist you in the laudable object you have in view in bringing into notice the vast tract of country embraced in the Great Mackenzie Basin.

I have carefully read all that has appeared in the papers lately in connection with your Committee, including Mr. W. J. Christie's evidence. Wishing you all success,

Believe me to remain

Yours sincerely,

G. J. McTAVISH.

Hon. Doctor SCHULTZ, the Senate, Ottawa.

Resources of the Great Mackenzie Basin.

UNITED STATES CONSULATE, WINNIPEG, B.N.A., 14th April, 1888.

Hon. J. SCHULTZ, Ottawa.

SIR,—I have received the elaborate series of interrogations upon the "Resources of the Great Mackenzie Basin" propounded by a Committee of the Senate of Canada, with your intimation as Chairman, that any response which I am enabled to make will be indulgently considered by your colleagues of the Committee. My personal experience is too limited for me to undertake more than a general expression of opinion, founded upon careful investigation of the extensive literature relating to the subjects of the food products and other resources of Central and Western Canada.

The results of the enquiry at a previous Session of the Dominion Parliament upon the Natural Food Products of the Great North Western area of the continent were so satisfactory—being in many respects quite in the nature of discoveries—that I am not surprised at the further investigation now in progress into the mineral and other resources of the Sub-Arctic District of the Mackenzie Basin, and I will venture to express the hope and belief that the Government of the United States will follow the territorial organization of Alaska soon to be consummated by the appointment of Commissioners not only to assist in the determination of the boundaries, but further to co-operate with the Canadian Government in the important investigations which occupy the attention of the Committees of the Dominion Senate.

Let us first consider the range that these enquiries take geographically. Open map of North America and trace the area enclosed between longitudes 100 and 170 west of Greenwich, and latitudes 50 to 70—a fourth of the continent—embracing the Canadian Provinces, present and prospective, of Manitoba, Assiniboia, Alberta, Saskatchewan, Athabasca and British Columbia, and the American territory and the future State of Alaska. How little conception have we from present developments, of what the twentieth century will witness over this vast realm of nature. It will assist our prophetic vision to compare a less area on the map of Europe identical in climate and other natural manifestations. Trace 60 degrees of longitude—50 east and 10 west of Greenwich—and from latitude 55 to 70, and mark the relations of man to earth. The European parallelogram of 15 degrees of latitude to 60 of longitude (the American division is 20 by 70) includes Scotland, Denmark, Norway, Sweden, Finland, Lapland and the northern moiety of Russia in Europe, represented by the cities of Glasgow, Edinburgh, Bergen, Copenhagen, Stockholm, St. Petersburg, Moscow, Nijni, Novgorod, Karan and Archangel.

Of this great north land of Europe, especially its eastern and continental division, I may be permitted to repeat my own language, published at Columbus, Ohio, in 1856. "The northern limit of rye is 65 degrees, of barley 67 degrees, and oats even further north. Wheat is cultivated in Norway to Dronheim, latitude 61 degrees, in Sweden to latitude 62 degrees, in Western Russia to the environs of St. Petersburg, latitude 60° 15', while in Central Russia the limit of wheat cultivation appears to coincide with the parallel of 58 or 59 degrees. It is well understood that the growth of the *cerealia* and of the most useful vegetables depends chiefly on the intensity and duration of the summer heats, and is comparatively little influenced by the severity of the winter cold or the lowness of the mean temperature of the year. In Russia, as well as in Central America, the summer heats are as remarkable as the winter cold. The northern shore of Lake Huron has the mean summer heat of Bordeaux in southern France, or 70 degrees, Fahrenheit, and Cumberland House on the Saskatchewan exceeds in this respect Brussels or Paris."

I can add nothing to the demonstration by innumerable explorations and reports, that the navigable channels of the Mackenzie and the Mississippi are connected by a territory of 1,500 miles in extent, north-west of St. Paul, Minnesota, having an average width of 800 miles (1,200,000 square miles), which is substantially identical in climate and natural resources. There is a great variety of illustrations, but I shall limit myself to a flower. The prairie's firstling of the spring has the popular desig-

nation of "crocus," but it is an *anemone*.—1. *Patens*, the purple *anemone*, the word flower, but I prefer the children's name suggested by its soft furry coat, the "gosling" flower—which, with its delicate lavender petals, is fully ten days in advance of other venturesome spring blossoms. It is often gathered on the Mississippi bluffs near the Falls of St. Anthony on the 15th of April. It appears simultaneously on the dry elevation near Winnipeg. It was observed even earlier, on the 13th of April, during the Saskatchewan campaign of 1883, and is reported by Major Butler, in his *Wild North Land*, as in profusion on Peace River, 1,500 miles from St. Paul on the 26th of April even 1,000 miles beyond on the Yukon, within the Arctic Circle. Archdeacon Macdonald, a missionary of the Church of England, has gathered the flower on the 14th of May. Equally significant as this delicate herald of the spring, are the records of ice obstruction in rivers—their emancipation being simultaneous from Fort Smelling, Minn., to Fort Vermillion, Athabasca.

Appreciating highly the scope and value of the Parliamentary Commission whose circular has called for the above acknowledgment, I will venture to repeat the results of a special enquiry into the capacity for colonization of the valleys of the Athabasca and Peace Rivers between latitudes 54 and 60 and longitudes 110 and 120 and an additional block of territory on the headwaters of the Liard River from latitude 57 to 60 and longitude 120 to 125; these streams being the most southern tributaries and indeed the sources of the Great Mackenzie.

The southern moiety has been carefully explored by Prof. George M. Dawson, of the Canadian Geological Survey, and is properly called Athabasca as comprising most of the affluents of the river of that name. He estimates its area as about 31,550 square miles, and adds that "by far the largest part may be classed as fertile, with an average elevation above the sea of little over 2,000 feet." In respect to the Peace River country, or the northern portion of the District of Athabasca, Prof. Dawson says that the ascertained facts leave no doubt on the sufficient length and warmth of the season to ripen wheat, oats and barley, with all the ordinary root crops and vegetables. The whole region is characterized by Archbishop Taché of St. Boniface in his "Sketch of Northern America," in terms far more favorable than he employs with reference to the Southern Saskatchewan districts. He speaks of "a fertile country, very well suited to colonization" on the Athabasca, and remarks that the valley watered by the Peace River "cannot but become peopled." Even more specific has been the testimony of early traders and travellers. Sir Alexander Mackenzie, as far back as 1787, saw at a trading station of Peter Pond, on the Elk or Athabasca River, "as fine a kitchen garden as he ever saw in Canada." Mr. William McMurray, an officer of the Hudson Bay Company, informed me that at post established by him in latitude 56, longitude 111, he obtained good crops of wheat, barley, oats and all garden vegetables. Sir John Richardson states that wheat is raised with profit at Fort Liard, latitude 60 degrees five minutes and longitude 122° 30', but with an elevation above the sea of only 400 or 500 feet; while Mr. Robert Campbell, a retired officer of the Hudson Bay Company, who founded Fort Halkett nearer the Rocky Mountains in the valley of the Liard River, reports an experiment of cultivation equally successful.

When, therefore, in 1879, I became solicitous, in answer to hostile criticism in influential quarters, to remove all reasonable doubt of the comparative mean temperatures at the interior points of Central British America and my inferences therefrom in respect to the extension north and west of cereal production, I communicated with Rev. A. C. Garrioch in charge of a mission farm of the Church of England at Fort Vermillion on Peace River, latitude 59°, longitude 116°; with Richard Hardisty, Esq., long an officer in charge of Fort Edmonton on the Saskatchewan River in about latitude 54°, longitude 114°, and P. F. Laurie, Esq., editor of the *Saskatchewan Herald* at Battleford, in latitude 53, longitude 109, and received and was able to distribute most satisfactory samples of wheat, barley, oats and pease from the localities of the crop of 1880.

In respect to the Peace River grains, I beg leave to communicate some explanations communicated to me by Mr. Garrioch. "The wheat sent you" he wrote "does not do justice to Peace River, for the summer last year was a most unfavorable

one, the rainfall being double what we have during an ordinary season, the consequence of which was that the straw grew too rank and the wheat from which my sample was taken lay on the ground under drenching rains for some time after it had been cut until it was partially damaged. At any rate I have never known poorer wheat raised in Peace River than we had last year." A better sample sent by Mr. Garrioch was from a mission station on Peace River opposite the junction of the Smoky River, nearer the Rocky Mountains and in a situation of greater altitude than Fort Vermillion, but 200 miles west of south—a locality 1,500 miles north-west of St. Paul or about two thousand miles from Chicago. Of a package of barley—a hulless variety, the seed of which was from Holland, from Fort Vermillion of Peace River, Mr. Garrioch wrote "for the barley no apology is needed. I gave the Roman Catholic priest at this place a bushel of it this spring, and wishing to be on the safe side weighed out 50 lbs., but on coming to put it in his bushel measure there was about two inches more required to make the proper bulk."

In corroboration of these specific statements, I find in the *Mission Field* of 2nd January, 1882, a London monthly publication of the Society for the Propagation of the Gospel, an abstract of a report of the Rev. W. Bompas, Bishop of the Church of England in the Athabasca and Mackenzie Districts—his diocese comprising the centre Arctic watershed of British America, of which the following extracts are pertinent: "The excellence of the land in the Peace River country for farming purposes is well known; the soil is rich and productive, and the climate most salubrious." A mission station is established at Fort Vermillion under the charge of the Rev. Arthur Garrioch and a church is fast approaching completion. Other mission stations have been started at different parts of the river, and in 1878 a mission farm was begun which the Bishop hopes will in time obviate the necessity of procuring all the supplies of flour, &c., from Red River, the expense of which from heavy freights is so great that every bag of flour by the time it reached the missionaries north of Athabasca costs upwards of £5. But even more remarkable is the Bishop's testimony of the cultivation at Fort Simpson on the Mackenzie River in latitude 61° 50'. "The English school master at Simpson" he adds, "has made successful experiments of farming in that northern region and through his energetic labors a good crop of barley was raised in the mission fields; also some wheat and potatoes, beans, pease, beet roots and other vegetables."

I will now endeavor in a few words to indicate the causes in my judgment for this remarkable north-western extension of cereal productions.

1. *Reduced altitude.*—The Union Pacific Railroad crosses the dome of the continent near latitude 40 with its highest elevation at Sherman of 8,000 feet, and with an average of 5,000 feet for fifty miles eastward from the Rocky Mountains. This piedmont on the route of the Northern Pacific in or near latitude 47 in Montana is reduced to an average of 4,000 feet; on the south branch of the Saskatchewan in latitude 51 for 3,000 feet; in the Athabasca district, latitude 55, to 2,000 feet, and in the valleys of the Peace and Liard River, latitudes 58 to 60, to 1,000 feet—until, subsiding north-eastwardly, the plains connect with the navigable channel of the Mackenzie at an elevation of only 300 feet above the Arctic Ocean. This difference of altitude is equivalent to 13 degrees of latitude, considered climatically.

2. *Pacific Winds.*—The Utah Basin, a plateau 800 miles in width, at an elevation of 5,000 feet, between the Rocky Mountains and the Sierra Nevadas, making a total mountain barrier of 1,400 miles, excludes the moisture of Pacific winds from the central areas of the continent, while the interlocking valleys of the Columbia and the Missouri on the route of the Northern Pacific Railroad and of the Fraser and the Columbia Rivers with the Saskatchewan on the route of the Canadian Pacific, facilitate the ingress and ameliorating influence of the Chinook or West wind of the Pacific coast to the eastern piedmont of Montana, Alberta and Saskatchewan, but it is only in latitude 55 to 60 that the remarkable physical effects occur of the Peace and Liard Rivers rising in the western slope of the Rocky Mountains and breaking through its barrier on their courses to the Mackenzie, after interlocking at their sources with the Skeena and the Stickeen.

3. *Summer Moisture*.—As a corollary to the foregoing facts of reduced altitude, and the inter-collation of the Pacific moisture, I am satisfied that there is no necessity of irrigation north of latitude 50°. In the north Saskatchewan, Athabasca and Peace River districts there is much evidence that the summer rainfalls, without being excessive, still exceeds the average of Manitoba and Minnesota.

4. *Solar Heat*.—On this subject I avail myself of a very intelligent statement of Prof. G. M. Dawson, of the Canadian Geological Survey: "In addition to the favorable climatic conditions indicated by the thermometer, the length of the day in summer in the higher northern latitudes favors the rapid and vigorous growth of vegetation, and takes the place to a certain extent of heat in this respect." This has been supposed to be the case from the luxuriance of vegetation of some northern regions, but Alphonse de Candolle has put the matter beyond doubt by subjecting it to direct experiment. In latitude 56°, which may be taken as representing much of the Peace River country, sunrise occurs on 20th June at three hours twelve minutes; sunset at eight hours and fifty minutes, while six degrees further south in latitude 50, which may be assumed to represent Manitoba, sunrise occurs on the same day at 3 hours 49 minutes, sunset at 8 hours 13 minutes, the duration of sunlight in the first place being 17 hours 38 minutes, in the second 16 hours 24 minutes, or one hour and a quarter in excess in the northern locality.

5. *Maximum of Fructification*.—Over the vast north-western territory, reaching from St. Paul in latitude 45 to Fort Liard in latitude 60—a region of rigorous winters, cool, moist springs, and dry but intense summers—the undue luxuriance of stem and foliage is checked in the first stage of growth greatly to the advantage of the fruit and seed. This vigor given to vegetation in cold climates by the rapid increase and prolonged action of summer heat has been often observed, but has been best formulated by Doctor Forry.

Samuel Forry, M.D., a physician and medical writer, born at Berlin, Pennsylvania, 23rd June, 1811, died 8th November, 1844, University of Pennsylvania, 1835. He was ten years in the United States army as assistant surgeon and was engaged in the Florida war, afterwards practised in New York city. He contributed many articles to medical journals, originated and conducted for two years the New York *Journal of Medicine*, and in 1844 received from Harvard University the Boylston prize for the best essay on the Protecting power of Vaccine. He published "Climate of the United States and its endemic influences," 8vo, N. Y., 1842. "Meteorology," New York, 1843.—Drake's Directory of American Biography.

He states as a universal fact "that the cultivated plants yield the greatest products near the northernmost limit at which they will grow. His illustrations embrace nearly every plant known to commerce and used either for food or clothing. Cotton, a tropical plant, yields the best staple in the temperate latitudes. Flax, hemp, &c., are cultivated through a great extent of latitude, but the lint in southern latitudes forced into premature maturity, acquires neither consistency nor tenacity; and we must go far north in Europe to find these plants in perfection. Rice is tropical, yet Carolina and Florida grow the finest in the world. Indian corn is a sub-tropical plant, but it produces the heaviest crops near the northernmost limits of its range. In the West Indies it rises thirty feet high, but produces only a few grains on the bottom of a spongy cob, and is regarded only as a rough provender for cattle. In the rich lands of the Middle States it will often produce 50 to 60 bushels to the acre, but in New York and in New England Agricultural Societies have actually awarded premiums for 125 bushels to the acre. Wheat is a more certain crop in New York, in northern parts of Pennsylvania and Ohio and the Baltic districts of Europe, than in the south either of Europe or America. In the spring it is not forced too rapidly into head before it has time to mature fully or concoct its farina. Oats grow in almost every country, but it is in northern regions only or very moist or elevated tracts, that they fill with farina suitable for human sustenance. Rye, barley, buckwheat, millet, and other culmiferous plants might be adduced to illustrate the above principle, for all their habits require a more northern latitude than is necessary to their mere growth. The branches are in perfection only in northern or cool regions although they will grow anywhere. It

is in the north alone that we raise animals from meadows and are enabled to keep them fat and in good condition from hay and grass alone without grain. It is there the grasses acquire succulence and consistency enough not only to mature animals but to make the richest butter and cheese. The grasses which do often in the south grow large enough are without richness and nutriment; in hay they have no substance, and when green are too marshy to fatten animals, the consequence is most animals in the east latitude brouse from necessity and are poor and without size and beauty which forces them to a rapid fructification before they have had time to concoct their juices. The tube-rose, bulbous, and other roots, cultivated for human and animal subsistence are similarly affected by climate and manifest habits in corroboration of the above principle. The Irish potato, although from or near the tropics, will not come to perfection but in northern or cool countries or in moist insular situations as in Ireland. It is in such climates alone that its roots acquire a farinaceous consistence and of size, flavor and nutriment enough to support in the eminent way in which they are susceptible animal life. In the south a forcing sun brings the potato to fructification before the roots have had time to attain their proper qualifications for nourishment."—(Extract from an article upon the "Acclimating Principle of Plants" in the *American Journal of Geology*)

So far, the suggestive illustrations of Dr. Forry, but I will venture to add a further instance from the central wheat district of North America at its southern margin in Southern Minnesota: seldom more than two well formed grains are found in each cluster or fascicle forming the row; in northern Minnesota, Dakota and Manitoba free grains become habitual; and from heads of wheat brought to me from Prince Albert on the Saskatchewan and Fort Vermillion on the Peace River I have separated five well formed grains from each cluster or group forming the head, which, as I have had several occasions to remark, is a decisive evidence that the perfection of the wheat plant is attained near the most northern limit of its successful growth.

6. *Fall ploughing for wheat.* I append to the foregoing summary of the successful conditions of wheat culture, a brief reference to the preparation of the soil, if not the sowing of wheat in the late autumn. The only instance of injury from frost are where invaluable time is lost in the spring by a neglect of the practice now universal in Minnesota and Dakota of fully preparing the ground for the seed in autumn, which can be supplemented with entire success in the Saskatchewan and other northern districts by sowing spring wheat subsequent to the 15th October. In 1880 Hon. A. G. B. Bannatyne, of Winnipeg, sowed all the varieties of spring wheat exhibited at the Provincial Fair of that year in his garden on the 2nd November, none of which failed to germinate in the following spring (although a mild open winter would be fatal) and all were harvested by the 8th of August.

The subject of animal development in high northern latitudes I will not undertake to discuss, but hope to be indulged in citing the experience of European Russia—especially in the districts north of Moscow—in respect to frosts. Neither the Province of Manitoba nor the North-West Territory of Canada within latitude 60° present conditions more adverse than the interior of Russia, or the contiguous districts of Siberia and Central Asia which are equivalent in latitude and other physical relations. To those regions, apples, pears, cherries and plums have been carried by civilized man in his migrations from milder climates northward, with gradual changes in the constitution of the trees until the above named fruits are successfully grown at and beyond the latitude of Moscow six degrees north of Winnipeg. Maltebrun describes a variety of apples grown at Kernak as weighing four pounds, of a delicious flavor, and keeping a long time. Another variety of apples grown in the vicinity of Moscow, which was brought from China, is described as so transparent that when held to the light the seeds in it can be counted. Adolph Erman, in his travels through Russia and Siberia in 1840 mentions with surprise that he found at Torzhok on the road from Moscow to St. Petersburg, north of latitude 57 and at Vladimix, north of 56 degrees, that apples and cherries of a superior kind were extensively grown and sold at moderate prices. Sir George Simpson, late Governor of the Hudson Bay Company, gives in his overland journey around the world an account

of his visit to Barnaul in Siberia, which is north of the little Altai Mountains and of northern China, and mentions the cultivation of apples there. In Dr. Clark's travels in Norway and Sweden, published in 1838, there is reference to the excellent apples, pears, plums, cherries and strawberries at Trondhgein in Norway in 63 degrees 20 minutes north.

In conclusion, I am sure that the Senate Committee, charged with such important interests, will pardon on my part an aspiration often expressed, that every encouragement may be extended to the great natural commerce between the cotton zone of the Southern States, the corn zone verging upon the great St. Lawrence lakes and the wheat zone ranging as far north as in Europe.

I am, sir,

Your obedient servant,

JAMES W. TAYLOR.

FORT SASKATCHEWAN, 27th February, 1888.

SIR,—Having seen by the public prints that you intend during the present session of Parliament, to call for a Committee of the Senate to take evidence and obtain information with regard to the extreme North-West, and the best mode of obtaining access thereto, I take the liberty of sending you some information collected from persons who have travelled through the Rocky Mountain region, and also a suggestion as to a cheap and serviceable route. The recent discoveries of gold on the headwaters of the Yukon River have added importance to that country, and if Canada intends to enjoy the benefit to be derived from them, an easy route must be devised which will enable miners to enter with sufficient supplies to enable them to work during at least two seasons, and such route must commence and run through our territory.

A waggon road starting from here or Edmonton to the head of Pelly River, the main branch of the Yukon, would fill the bill and bring under 800 miles in length, of which 180 miles is already completed, and 200 miles may be classed as light prairie, and the balance 360 light timber, that is openings and bluffs. This route would run to the Athabasca Landing (90 miles road built), thence to Lesser Slave Lake Post (160 miles), thence to Peace River (90 miles of road built), thence to Fort Halkett, on the Liard River (200 miles) thence to the head of Pelly River (200 miles). The distance sounds long, but from the information I have obtained it seems that in no part of the whole distance is the timber heavy, muskegs are few and short and all agree that the road is quite practicable.

The advantages of such a route are obvious, when it crossed the Peace River and Liard River it would give command of those rivers, and in fact of the whole Mackenzie River Basin, without having to pass the dangerous rapids on the Athabasca River, and the long traverse across Great Slave Lake.

It would also be the cheapest route to the miner going to the Yukon or the Cassiar Mines, in fact valuable mines exist on the Liard that have been worked more or less ever since 1873. The miner going to the Yukon would be enabled to reach the mining ground a month earlier than he possibly could by the Pacific coast route.

It costs a man going to the mines by the coast with two years' supplies at least \$400, by this route it will not cost him more than \$250, a difference of \$150—quite an item to a poor man.

By the coast route the miner's supplies must be purchased in Duncan or Sitka, in American territory, and on coming out he is likely to spend his money there, thus depriving Canada of any benefit from the gold mining on her own territory.

Again the Pelly River is navigable from Houle Rapids, 25 miles from Pelly Banks Post, to its junction with the Porcupine River, 1,000 miles without a break;

while on the other hand the Lewis River, down which miners from the coast must travel, is broken by numerous rapids and three lakes, out of which the ice does not move until July.

As a fur country, the region opened up by such a road is unsurpassed on the continent, and for that reason, doubtless, strong oppositions will be made to its construction.

The present cost of provisions on the Yukon is

Flour.....	\$100 per 100 lbs.
Bacon.....	250 "
Beans.....	250 "
Apples.....	250 "

and other articles at like rates. By the above route a miner can lay down two years' supplies for what it now costs him for 100 lbs. of pork brought in by the coast. By the coast route the American trader profits, by the other the miner gets the benefit and Canada the indirect benefit.

Trusting you will excuse my taking so much of your time.

I remain, sir,

Your obedient servant,

STUART D. MULKINS.

The Hon. SENATOR SCHULTZ, Senate, Ottawa,

OTTAWA, Friday, 20th April, 1888.

ISIDORE CLUT, O.M.I., Bishop of Arindele, called and examined.

By the Chairman :

25th Question:—A. I have never seen the barren grounds. What I have stated here in this document is what I have heard of them. From the abundance of lichens I should think that the country is rocky and strewn with boulders. The reindeer country is generally gravelly or rocky.

Q. In your opinion will those grounds ever be of any use except as a range for wild animals? A. Fish abound on the sea coast of the barren grounds, but the land itself can never be utilized. Some valuable minerals or precious stones, or something of that kind may be discovered there, but in my opinion that region will never be a source of wealth to the Dominion.

By Honorable Mr. Girard :

Q. Have you ever heard of the existence of valuable minerals in any part of the barren grounds? A. I saw a man named McCarthy, at Fond du Lac, Lake Athabasca, who told me that he had discovered gold. but as he is not an educated man I do not know whether he is mistaken or not. He says he will not show it to anybody, but that he is almost sure that he has found a gold mine.

Q. Nobody has brought to you specimens of gold, silver or anything of that kind from that region? A. No. In the Peace River and the Liard River certainly there is gold in large quantities. It is found in the sand bars and I fancy that mines will be discovered in the Rocky Mountains and that the gold is carried from that part the same as in British Columbia, on the other side of the mountains. I should imagine therefore that there are considerable veins of gold in the Rocky Mountains. On the Peace River 12 or 13 years ago miners made from \$15 to \$20 a day washing, but in the winter and when the water was high they could not work and they abandoned the mines. Gold is found in the sand bars on the Peace and on the Liard Rivers. If the country were settled those mines might be worked to better advantage, because the miners could find other occupation in the winter and when the water was high. Certainly if a railway were constructed to the mines on the Peace River or the confluence of the Peace River and the Athabasca, the Dominion would derive great advantage from the forests, mines, fisheries and furs.

By Honorable Mr. Girard:

Q. Where should the railway be built? A. To the confluence of the Smoky and Peace Rivers, or perhaps better to the mouth of the Clearwater, because there a steamer could run as far as Fort Smith without obstruction. It would be advisable to build a railroad about twenty miles long to overcome the obstruction to the navigation at Forth Smith, and from Fort Smith a steamboat could run to the Arctic Ocean.

Q. Can the obstruction at the confluence of the Smoky and Peace Rivers at the Hudson Bay Company's landing be easily overcome? A. Yes.

By the Chairman:

Q. Supposing the railway were constructed and these improvements were made, what trade would be derived from that country which would benefit Canada? A. All the country around Lac la Biche and up to Lesser Slave Lake on the Peace River and the Liard River is suitable for settlement. Another source of profit is the immense quantities of fish found in the great lakes, the Athabasca, Great Slave and Great Bear Lake, and east of those lakes there are many other great lakes which are full of fine fish.

Q. What kinds of fish? A. The most abundant fish are the whitefish, salmon trout and speckled trout, the jackfish and the carp.

By Honorable Mr. Girard:

Q. Is the *Inconnu* a good fish? A. It is as good as the whitefish, but it is a larger fish. It weighs from 8 to 25 or 30 pounds. The mouth is very small and the fish feeds on worms. These fish are very numerous.

By the Chairman:

Q. You have mentioned that such a railway would carry all the agricultural products of the district; you have mentioned also the fish of a great region: what timber would they have? A. We have large quantities of spruce. On the Liard River, the south branch of which I have ascended often, and on the Peace River also there are magnificent forests of spruce. The trees are from 80 to 100 feet high on the islands. Spruce is also abundant on the Mackenzie.

By Honorable Mr. Girard:

Q. How large are the spruce? A. From two to three and three and a half feet in diameter. At a place called Big Island there are fine spruce trees to be had.

By the Chairman:

Q. What can you tell us about the supplies of salt, sulphur and petroleum—would a railroad have large quantities of these things to carry? A. On the Mackenzie we have what we call the Salt River, where probably the finest salt in the world is to be found. There is a perfect mountain of salt there. At the foot of that mountain along the Salt River there are salt springs, the salt in which crystallizes in the winter, and in the spring you can get heaps of the finest salt you ever saw at those places. A short way from the springs if you remove the surface of the earth for a few inches you will find large quantities of rock salt perfectly pure.

Q. The salt springs near Lake Winnipeg are perfectly pure in appearance and yet the salt which comes from them is not so good as English salt, because it will not preserve meat so long; is this salt on the Mackenzie of the same character? A. Generally we do not use salt for preserving our meat or fish, but I believe from what I know of the salt in the country that it is as good as any salt in the world.

Q. What about the sulphur and petroleum? A. I have seen sulphur in several places myself. On the Clearwater River these sulphur springs are very abundant. Travellers use the water of these springs for medicine. It occurs most abundantly at the south-west corner of the Great Slave Lake. There is a place there that we call Sulphur Point and in summer or winter the traveller passing by it has to keep his mouth shut so as not to inhale the fumes. It may exist in other parts of the country, no explorations having been made that I know of for petroleum. If I were a scientist I might be in a position to answer the question, but I am under the impression that petroleum must exist in some parts of the Mackenzie Basin.

Q. My question refers to Mackenzie River pitch? A. It is found in many places along the Mackenzie River where it is very abundant. It is also abundant at a point on Great Slave Lake which is called Slave Point, and near Fort Good Hope I know of pitch being found. I know that it occurs at those places.

Q. Is there a large extent of country where this pitch occurs? A. Yes. I have not examined it carefully. Travellers who require to use it touch at the shore where it is most convenient, and procure all they want. Very likely there is much more of it at places distant from the rivers.

Q. Is there anything else in that country that could be exported if a railway were built? A. I have not mentioned the furs. The Mackenzie district is the finest fur country in the world, and the farther north you go the finer the fur is.

By Honorable Mr. Girard:

Q. Have the fur-bearing animals decreased much in numbers since you first went to that country? A. No, I think not. The beavers have diminished in number in the Peace River because the Americans come in there and kill a great many, but nearly everywhere in the country, it is so extensive, I think in general the fur-bearing animals have not diminished in numbers. The large animals such as the moose, the reindeer, the buffalo and others have diminished in numbers since firearms were introduced, but the fur-bearing animals have not. Foxes are sometimes diminished a great deal in numbers when poison is used to kill them. The Government ought to punish severely anyone who sets out poison.

By the Chairman:

Q. I may call the attention of the Committee to the fact that I have been able to procure the Hudson Bay Company's list of furs offered for sale in London during the year 1887; this is exclusive of Leipzig. I have taken two of the articles as an illustration and I find that 154,000 beavers' skins were offered in London last year for sale, and that they brought—the prime beaver—49s. 6d. per skin, about \$12 of our money. The year before they were not quite so high. This would represent at those prices \$1,500,000 in beavers alone. In addition to this there is the other article of which I have made up the numbers. We find that 2,500,000 musk-rats, called technically here "Musquash," were also offered for sale and brought from four and a half pence to eight and a half pence each, also representing a large amount. It is quite evident from this that the returns given to us from the Department of Customs as to the values of furs represent the values in the interior of the country, and not by any means the values at which they were sold in the market. We would like to know what proportion of beaver came from the Mackenzie River district as compared with other parts of Canada and also the proportion of musk-rat? A. I would not venture to say because I do not know. I can only say generally that very large quantities of furs are exported. Large quantities of fox skins of all kinds are exported, the most valuable being the silver, grey and black. There are besides the red, the blue and the white fox: mink, otter, marten, lynx and fisher. The fisher is similar to the marten but is larger and three times as valuable.

Q. Are beaver trapped now as they were in the past? A. Yes.

Q. Where the Hudson Bay Company have no opposition what prices do they pay for furs? For example, what is the price of a beaver now? A. The difficulty of giving the price is this—that the company throughout the whole of the interior have a peculiar tariff—a pound of sugar or two pounds of sugar is equivalent to one skin. The beaver is the basis of this. A bear may be two or three beavers. The beaver is the unit of value. It depends a good deal on what the Indian takes. A cotton handkerchief is one skin.

Q. A beaver that brings the Hudson Bay Company 49s. 6d. in England is bought with a cotton handkerchief? A. Yes. The company make a practice of rating necessary clothing, guns, axes, &c., at very reasonable figures, whilst purely fancy articles are more expensive.

By Honorable Mr. Girard:

Q. Are liquors sold there? A. I have received letters this winter from our missionaries who tell me that liquor was being brought in there. Several com-

panies in opposition to the Hudson Bay Company on the Peace River and on the Athabasca—there is only the Hudson Bay Company on the Mackenzie—last summer brought in liquor and sold it to the Indians. It will ruin the savages, and the Government should adopt stringent measures to prevent the introduction of liquors amongst them. Formerly the Hudson Bay Company sold liquor to the Indians, but they found it did a great deal of mischief and they gave it up very many years ago.

By Honorable Mr. Power :

Q. Are there salmon in the Mackenzie River? A. The true salmon is not found in the Mackenzie River. What is called the *Inconnu* is found there. It is more like a whitefish than a salmon.

Q. Do you know why there are no salmon there? Is it too cold at the mouth of the river? A. There are no salmon in the Arctic Ocean. *Inconnu* comes up from the sea. In all the large lakes salmon trout are found. I have seen the true salmon on the Yukon River and they came up from Behring Sea.

The Committee adjourned until 10.30 a.m., to-morrow.

THE SENATE,

COMMITTEE ROOM No. 17,

OTTAWA, 21st April, 1888.

The Committee met at 11 a.m.

The following letters were read:—

COMMISSIONER'S OFFICE,

HUDSON BAY COMPANY,

WINNIPEG, 17th April, 1888.

SIR,—I am requested by the Commissioner to inform you that he will have much pleasure in replying to as many questions sent to him as he is competent to answer.

Mr. Wrigley desires me also to state that he will return the paper in a short time, but is anxious to obtain some little information before replying.

I have the honor to be, sir,

Your obedient servant,

ARTHUR ROBERTSON.

The Secretary of the

Committee on the Resources of the Great Mackenzie Basin.

The Senate, Ottawa.

CENTRAL EXPERIMENTAL FARM,

OTTAWA, 18th April, 1888.

HON. DR. SCHULTZ.

Dear Dr. SCHULTZ,—Your favor of the 16th is at hand. The circulars relating to the samples of polar grain will be mailed at once to the parties whose names you have given in the appended list and addressed as you direct, care Joseph Wrigley, Esq., Winnipeg.

Yours very sincerely,

WM. SAUNDERS.

P.S.—I will send to the Department of Agriculture for the samples you have returned there.

W. S.

DEPARTMENT OF CUSTOMS, OTTAWA, 20th April, 1888.

Hon. Dr. SCHULTZ, the Senate.

DEAR SIR,—I have your favor of the 18th inst., in reference to the quantity of furs exported.

We have no invoices of goods exported of furs, which give the numbers and description of the different kinds; they are retained at the ports, the returns received here only containing the information which I have sent you.

Yours truly,
M. BOWELL.

Telegram.

To Hon. Dr. SCHULTZ, 188 Maria street, Ottawa:

FROM MONTREAL, 20th April, 1888.

The furs sold by Lampson are nearly all from British North America or Alaska, except the skunk, racoon, grey fox and opossum, and some few southern and south-western skins.

JOHN MARTIN.

ISIDORE CLUT, O.M.I., Bishop of Arindele, reappears and his examination is continued as follows:—

By Honorable Mr. Girard:

Q. Are there any oyster beds at the mouth of the Mackenzie? A. I have never seen any or heard of any.

Q. Are shell fish found in any part of the Great Mackenzie Basin? A. No. I saw crabs when I was ascending the Beaver River.

By Honorable Mr. Bolduc:

Q. What size were they? A. Fair size.

Q. Have you seen anyone eating those shell fish? A. No. An Indian would not eat a shell fish. He would find it unsatisfactory food.

By the Chairman:

Q. How far north has the potato been grown to your knowledge? A. We raise potatoes even as far north as the Polar Circle at Fort Good Hope, but they are very small. We have no bread there, and an Irish Brother has raised potatoes every summer. Once I passed a winter there and they had very little potatoes. Out of five bushels planted they only got six bushels. Two years ago I passed the winter there, and out of ten kegs they got twenty-five. At Fort Simpson and Fort Wrigley and Providence Mission and up the Liard River potatoes are very good. In Peace River potatoes ripen well and are large.

Q. To what do you attribute the small yield of potatoes? Is the ground too dry? A. Generally the climate is too dry, and it is too cold.

Q. Is the soil good? A. In some places the soil is very good; in other places it is bad—sandy and rocky. In general the soil is not very good. A while we can raise potatoes, barley and wheat; they are generally grown along the banks of the rivers. The soil in such places is generally alluvial, and the high temperature of the water affects the climate, enabling us to raise something, but far inland where the Indians have tried to grow potatoes and barley, generally the frost spoils them, even in the middle of the summer.

By Honorable Mr. Kaulbach:

Q. I suppose at Fort Good Hope the season is too short for growing potatoes? A. Yes, that is the reason the potatoes grew so small and it is sometimes too dry weather.

By Honorable Mr. Girard :

Q. Those frosts occur generally in the middle of summer, or is it only occasionally? A. In the interior of the country, distant from the lakes and rivers it occurs usually in the summer. The land is good, but it would not be safe to cultivate it because the tops would be destroyed by the frosts.

By the Chairman :

Q. I understood from what you said in French that you mean this: that Fort Good Hope was the farthest possible limit of cultivation. The safe limit would be the other posts you have mentioned—Fort Wrigley, Fort Simpson and Fort Providence? A. Yes. The Athabasca and Peace River and south branch of the Liard River are certainly good for agriculture, but I fancy it is only along the rivers that agriculture is safe. I do not think it would be safe in the interior of the country because of the summer frosts to which I have referred. The country east of Great Slave Lake and Lake Athabasca is no good for agriculture, being principally rock and sand.

By Honorable Mr. Bolduc :

Q. Along the rivers what portion do you consider fit for settlement? A. In the valleys of the rivers for two or three miles on each side. I have been twice to Athabasca River by the Lesser Slave Lake and to the Peace River country, and the south branch of the Liard River. In all that part of the country you will find land good for cultivation but only along the shores of the rivers down in the basin where it is protected from the winds and cold. In the interior although the land is probably good the summer and early frosts would destroy the crops.

By Honorable Mr. Macdonald (B. O.) :

Q. Did you find any portion east of the great lakes fit for grazing cattle? A. Yes, but the winter is so long that it would not pay. We have horses and cattle for our own use, but to raise them in large numbers it would cost too much. The winter is too long. We are obliged to feed cattle about seven months of the year.

By the Honorable Mr. Girard :

Q. Could you give us an idea of what you and the Brothers attached to your missions have done in the vicinity of these missions in the interest of agriculture? Were you the first to cultivate land there, and how did you succeed with wheat, barley, roots and everything else? Where is your principal residence? A. My principal residence is at Providence, about 40 miles below the Great Slave Lake. The soil is very good there. We raise fine potatoes. One year I raised 1,400 kegs of potatoes. A keg of potatoes is about ten gallons.

Q. From how much seed? A. From about 60 kegs. It was a very warm and favorable summer, and we had rain in good time. Another year we had 1,200 kegs, and another year 1,000.

Q. From the same quantity of seed? A. Yes.

By Honorable Mr. Bolduc :

Q. On how many acres of land? A. Generally we plant potatoes pretty wide apart. I cannot say how many acres we cultivated.

By Honorable Mr. Girard :

Q. How many acres of land have you at Providence? A. There is about a quarter of a square mile cultivated.

By Honorable Mr. Power :

Q. Do potatoes ripen well every year? A. No; generally they do not ripen well. If they would ripen well we would have much more in Peace River; at the south branch of the Liard River at Fort Liard they ripen very well. At Fort Providence we raised about 50 or 60 bushels of barley.

Q. Is barley a sure crop—does it ripen every year? A. Yes; every year.

By Honorable Mr. Girard :

Q. Does it suffer from frost? A. Occasionally. One or two springs after it had come up it was injured by the frost, but generally it is all right.

Q. Is it in the spring of the year that it suffers from frost? A. Yes.

By Honorable Mr. Power:

Q. Is it good large grain? A. Yes.

Q. Do you know what is the return from each bushel sown? A. About fifteen bushels.

By Honorable Mr. Girard:

Q. What have you raised in the way of wheat? A. At Providence Mission sometimes it ripens—never entirely—but the soil is splendid. I remarked once I never saw wheat so nice so far as the plant was concerned, but we had a very short summer, only about one month of great heat, and in the fall it froze a little, but we used it. We had nearly 200 bushels.

By Honorable Mr. Kaulbach:

Q. For root crops do you require any manure. A. Yes.

Q. Do you use it? A. Yes.

Q. Have you many cattle there to provide manure? A. Generally we have about 15 or 20 head of cattle at Providence. I lived 13 years at Fort Chippewyan, at the Athabasca Lake. There we have a fine piece of ground, though the country is generally rocky. The west side, on the Peace River, the soil is good—generally along the Peace River the land is good.

Q. Do the Indians help you in working the soil? A. A little. Sometimes they help us to plant potatoes.

By Honorable Mr. Girard:

Q. Is your mission still in existence at Fort Chippewyan? A. Yes; we have a large mission there; it is as large as the one that we have at Providence. We have about 65 persons there. We have a number of poor children at the Mission, about 40.

By Honorable Mr. Macdonald:

Q. Do the Indians live there? A. No; they live in the woods. They come to the mission in the fall and the spring in order to see the missionaries and to exchange their furs. Along the Athabasca River at Lac la Biche we have a large mission. Bishop Farand lives there. We have about 80 head of cattle there. Generally all over Mackenzie Basin the Indians come to the missions every fall and spring.

By Honorable Mr. Girard:

Q. Fort Good Hope is the most northerly of your missions? A. Yes. On Peace River we have a mission at Vermillion, and the Anglicans and the Hudson Bay Company also have good farms there. Along the river we have about four or five missions. On the Liard River we have two places and at Fort Nelson and around Great Slave Lake we have three missions. Along the Mackenzie, we have missions at Fort Wrigley and at Fort Good Hope.

Q. Are you cultivating the soil at all those missions? A. Yes; except at Fond du Lac of Athabasca Lake and Fond du Lac of Slave Lake.

Q. Have you any assistants at those missions—Brothers and Sisters? A. Yes!

Q. Have you any industrial schools? A. We have three schools, one at Lac la Biche, one at Lake Athabasca, at Fort Chippewyan, and another at Providence. There are three large schools. We have about 40 girls and boys that we are feeding and teaching free at Providence; 25 at Nativity Mission, and about the same number at Lake La Biche. There are a few half breeds among them.

Q. But generally speaking they are Indians? A. Yes, the half-breeds belong to servants of the Hudson Bay Company, and some of these pay thirty shillings a year—that is five or six dollars a year for keeping and teaching.

By Honorable Mr. Power:

Q. I suppose the payment is in furs? A. Yes, money is not known there at all. I passed thirteen years there without seeing any money at all.

By Honorable Mr. Girard:

Q. What are those Indian children trained or prepared for? A. Our object is to make them good Christians. We teach them religion and we teach them to be clean, and try to civilize them. Some of them become servants of the Company or of the missionaries, and sometimes the young fellows become clerks of the Company.

Q. At what age do you let them go? A. As we have only sisters to teach the children, according to the rules, we must let the boys go at fourteen. The girls we generally keep until they marry.

Q. You think then that the improvement of the Indians is possible? A. Certainly. Nearly half of our Indians know how to read and write, but in Indian characters. I have here in my pocket a letter which is a sample of their writing. I have in Montreal a number of these letters sent to me by the Indians.

By Honorable Mr. Kaulbach:

Q. At what age do the females generally marry? A. Very young—from 14 to 18. This letter which I produce is written in Indian characters. Last year I translated one and had it published. We teach the young boys and girls English, French and Indian.

By Honorable Mr. Macdonald:

Q. When the young girls get married do they improve the condition of their husbands? Are they cleaner? A. Yes.

By Honorable Mr. Girard:

Q. Are these people willing to work? A. Yes.

Q. Are they otherwise improved? A. Certainly. Indians in the north are generally not so lazy as the Indians in the south, they are not spoiled.

By Honorable Mr. Power:

Q. Are the natives in the neighborhood of Fort Good Hope Indians or Esquimaux? A. The Esquimaux are around the Hudson Bay and the Arctic Sea.

Q. They do not get as far south as Good Hope? A. No, the Esquimaux generally live along the sea shore.

By Honorable Mr. Girard:

Q. Do you raise enough crops to feed your people at any of those missions? A. The crops that we raise are a great help to us to live there, because flour costs at Fort Good Hope \$30 a bag—that is \$30 for 100 pounds of flour.

Q. So you do not use much bread? A. No. I may say that we never eat bread.

Q. You have no mills to grind grain there I suppose? A. I got a small mill power and took it to Providence, and we made some flour there.

Q. How do you work the mill, by wind or water power? A. We tried by water and did not succeed, and now we work it by oxen.

Q. What do you live on, mainly? A. Generally on fish.

Q. I have heard that sometimes you suffer a good deal when the Indians do. The Committee would like to know if that is the case? A. Generally our food is fish, almost altogether fish. When I first went there the moose and reindeer and other large animals were more numerous than they are now. They are becoming more scarce, and we are obliged to live mainly on fish. Sometimes for months through the winter, and even in summer, we live on fish and barley soup.

By the Chairman:

Q. What is the cause of the diminished number of wild animals? A. The reasons that I have mentioned in my report—it is generally because Indians are improvident. If they could kill all the animals in a band they would do it. Since they have got possession of improved firearms, they kill too many.

By Honorable Mr. Girard:

Q. Do you think there would be any use in passing a law to protect the wild animals? A. I think it would be a good thing, but I do not know if the Indians would submit to it. I think, however, it would be a good thing if a law were passed. The missionaries and traders would instruct them how to take care of the game.

Q. What is the average number of young children you are caring for and instructing? What is the average number in each school at your missions? A. About forty at Providence Mission, about twenty-five in Athabasca Mission, and about thirty at the Lesser Slave Lake and Lac la Biche. Besides that the mission-

aries are teaching the Indians to read in their Indian characters. About half of them know how to read and write.

Q. Is there any considerable number of white people settled in any part of the country you have been describing? A. At nearly every place where the Hudson Bay Company have posts, we have missions for giving the Indians religious instruction.

Q. But is there any considerable number of white people there? A. No, except that at Lac la Biche.

Q. Is there a small village of white people there? A. There is a large settlement around Lac la Biche.

Q. What is the number of white people living in houses there? A. There are about 1,000 people altogether living around the lake, some of them Indians, but most of them half-breeds.

By the Chairman :

Q. We have not been able to get from any source an account of the number of Indians that inhabit that country? A. There are very few.

Q. Could you give us an estimate of the number? A. I should think there were about 15,000 in all. In the Mackenzie Basin there are about 20,000 Indians in all.

By Honorable Mr. Girard :

Q. Between its source and the Arctic Sea? A. Yes.

Q. How are they distributed? Will you please mention the different tribes, the number and places where they are chiefly found? A. Along the Athabasca River and Lac la Biche, as I have said, there are some white people, mostly half-breeds.

Q. French or English? A. French half-breeds and some English half-breeds, but not many. Along the Athabasca River there are Cree Indians. The Crees belong to the Algonquin race. Down the river to Athabasca Lake there are Chippewyans. In the Peace River country, the Upper Peace River, there are some Iroquois half-breeds.

Q. Are any of them pure Indians? A. They are mixed with the Indians there. They married wives in the tribes there.

Q. But they are pure Indians? A. Yes, they come from Caughnawaga.

Q. What is the number of them? A. I do not know, but I guess about two or three hundred. Going down the Peace River we have what they call *les gens libres* (freemen).

Q. Are they Indians? A. Yes, but generally they have some white blood. They live differently from the other Indians.

Q. Are they more intelligent than the rest of the Indians? A. Yes. The Beaver Indians also live in the Peace River country, and down the river the Chippewyans again. Around Athabasca Lake and Great Slave Lake, Bear Lake, and the eastern part towards the Hudson Bay, they all belong to the Chippewyan tribes, but they speak different languages. We have what we call the Yellow Knives, and the Eaters of Caribou, and along the Mackenzie River the Slave Indians. On the Liard River, we have three tribes, but they are not numerous. There are some Slave Indians and some they call *Les Gens Mauvais Monde* (bad Indians) but they are not bad. They have a loud way of speaking, and white people used to think they were quarrelsome, and therefore called them "mauvais monde." Along the Mackenzie River we have the Slave Indians. At Fort Good Hope, we have the Rabbit Indians, and Loocheux. Below the Rabbit Indians the Loocheux are found. The first English people who came there called them "quarrellers," probably because they speak very loud; beyond those we find the Esquimaux.

Q. Do they live on good terms with each other? A. No. We have three races which are quite different in the Mackenzie River Basin—the Esquimaux, the Chippewyans and the Algonquins.

By Honorable Mr. Bolduc :

Q. Do they live in peace together? A. The Crees and Chippewyans live well enough together, but the Esquimaux will have nothing to do with the others. Gen-

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ally they will not intermarry—they are entirely separated from the rest of the Indians. These three races have languages entirely different—not a word in common. Each nation is divided into tribes, speaking a number of dialects. The Chippewyans have about eleven or twelve different dialects quite different. Some of them differ nearly as much as French differs from English.

Q. Although of the same region? A. Yes, generally.

By the Chairman:

Q. You have described the three divisions; you say you have the Crees, which are a branch of the Algonquins; the Chippewyans and the Esquimaux; now, can you give us the comparative numbers of these populations? You mention that the whole population is 20,000; can you tell us now how many there are of each of these three races? A. I do not know about the Esquimaux, and I doubt if anyone can tell what their number is, because they are scattered along the sea coast. Very few come to the company's posts or the missions, but I should think they are not numerous. There may, perhaps, be about one thousand, but of this I am not sure. The Chippewyans may number about 14,000, and the Crees about one thousand. There are some other Indians, such as the Iroquois and these Freeman, and there are a few white people.

Q. Which of these tribes receive religious instruction best? Which do you have the least trouble with in trying to Christianize them? A. Until now, we have not had enough missionaries and our resources being slender, we have not seen very much of the Esquimaux. Some of them are Christians but very few of them. What we call the Loocheux and the Chippewyans generally are fond of religion, and accept it generally, if we are good and kind to them and understand their language, as soon as we teach them.

Q. More so than the Crees? A. Yes. The Crees are more difficult to manage. They are not so solid in their way, they like fun and are not provident. They are a good deal like the cigale (*cicada*); they do not trouble themselves about the future. Last winter out of a band of 30 people, 27 died of starvation.

By Honorable Mr. Power:

Q. Where was that? A. Near Fort Vermillion.

By Honorable Mr. Macdonald:

Q. Was there any Government agent to look after these Indians? A. We have no Government agent in the country. There are only a few of the Hudson Bay Company's people who are justices of the peace.

Q. What way have these Indians of making their wants known to the Government? A. Neither the Indians of the Mackenzie River Basin nor the Indians of Lac la Biche receive anything from the Government. One thing is pretty hard for the missionaries: since that country has passed into the hands of the Dominion Government we are obliged to pay duty on everything we import. Before that we had no duty to pay, and now the duty is so heavy, between 20 to 25 per cent., that it takes a good part of our small means which we used to spend on the poor.

By Honorable Mr. Bolduc:

Q. On what do you have to pay duty? A. On every variety of merchandise that we get at the stores.

By Honorable Mr. Girard:

Q. When those Indians at Fort Vermillion were starving, was it possible to communicate their condition to the Government? A. No.

Q. If it had been possible, how long would it have taken to send a communication to Ottawa even by mail or by telegraph? A. It would have taken a messenger one month to go to Edmonton, the nearest point.

By Honorable Mr. Sanford:

Q. What were the special circumstances under which those people starved to death? A. I was told by the missionaries that the snow came very early in the fall and those poor Cree Indians had no snowshoes and they could not go out to hunt, so they died by starvation. At last they were eating each other.

By Honorable Mr. Girard :

Q. Is religion producing a change for the better in the Indians? Are they more provident, and do they work better when they are under the control of the clergy there? A. Certainly. They have made great progress since the priests have gone there to teach them.

Q. All those Indians live on fish; they have no flour I suppose? A. They live by fishing and on the fruits of the chase. Some of them raise potatoes.

Q. Are they helped in one way or another to obtain employment by fishing? A. The Hudson Bay Company and traders there generally want to have plenty of meat and furs, and they do not give nets or net twine enough to the Indians even in selling them, because they want to have plenty of furs. They think, I suppose, that if the Indians had plenty of nets they would live around the lakes and along the rivers and would not hunt for furs, and many times Indians starve because they have no hooks or nets. For that reason I gave orders to our missionaries as far as possible to buy more net twine. We get our twine generally from England and sell it or give it to the Indians to prevent starvation, but our means are too small to supply enough.

Q. But those things must be cheap? A. Yes.

Q. Do you think it would help matters if any money were put in the hands of the missionaries? A. Certainly; even although it were only to buy hooks for them—large hooks for catching trout.

Q. Would it prevent starvation? Q. Yes; in many cases hooks and net twine would. I will give an example. This winter I received a letter from Father Pascal at Fort Chippewyan, who told me that in the fall the missionaries, Hudson Bay Company people, halfbreeds and Indians had lost many of their nets. The Father told me: "We are so poor that we have just the number of nets necessary for our own living and we have lost ten. I am very much afraid that some fall all our nets may be broken with the ice. The ice was pretty thick and a great wind came and broke it up and a number of nets were destroyed." The Father told me also that it would be a charity to send net twine up there. The letter was published in the *Minerve* of Montreal, and the *Catholic Record* of London.

By Honorable Mr. Reesor :

Q. Is there a very marked difference between the severity of the cold at that mission, 55 miles north of Great Slave Lake and the cold about the city of Quebec? Would a person who has lived in both places realize a great difference? A. Yes, a great difference. In general the cold is about a good third greater than here at Montreal or at Ottawa. At Fort Good Hope it is nearly one-half.

By Honorable Mr. Kaulbach :

Q. That is in the extreme of winter you are speaking of? A. Generally.

Q. In summer time I suppose it is warm? A. In summer time it is very warm. Last winter out of thirty one days in January they had sixteen days during which the mercury was 40 to 54 degrees centigrade.

By Honorable Mr. Macdonald :

Q. Have you carried stoves in there to heat your houses? A. Yes.

Q. Is there plenty of wood up there? A. Yes.

By Honorable Mr. Kaulbach :

Q. Did your stoves come in by way of Hudson Bay? A. Yes, it cost a great deal to get them in there.

By Honorable Mr. Sanford :

Q. Do you get in your supplies by the mouth of the Mackenzie? A. No, we get them now by the Canadian Pacific Railway to Calgary and thence by caravans north.

Q. How long does it take to convey the freight from Calgary to the extreme north, say to Fort Good Hope? A. Two summers ago I came from Good Hope. I was just three months travelling from Fort Good Hope to Qu'Appelle, and travelling pretty rapidly too.

By Honorable Mr. Girard :

Q. With horses? A. No, by the river.

Q. But you had some portages, I suppose? A. Yes. I came from Good Hope to Clearwater River by way of Portage la Loche to Isle à la Crosse and Beaver Lake, and from there by Prince Albert.

Q. Did you stop at any missions on the way? A. About five days in all.

Q. Have the Hudson Bay Company started the cultivation of land in there? A. No. They cultivate a little for themselves, but generally the missionaries cultivate the land. The Catholic missionaries raise more on their farms than any. The Anglicans on the Peace River have a very good farm at Vermillion.

Q. So the cultivation up to the present day has been in the hands of the clergy mainly? A. Yes.

Q. What is your impression of the country? Do you think it will ever be settled as an agricultural country? A. Yes, if we had a railway to Clearwater—near Methy Portage, known as Portage la Loche. At Fort McMurray the Clear River joins the Athabasca. A railway to that point would be a very great boon to the country, because from that point you can descend to the mouth of the Mackenzie River by water.

By Honorable Mr. Macdonald (Midland):

Q. How long would that railway you speak of be? A. Starting from Prince Albert, a branch is being built in that direction. From Prince Albert it is not very far to Fort McMurray. From the Saskatchewan to the shores of the Peace River is about 60 or 80 miles, and perhaps something more.

By Honorable Mr. Sanford:

Q. A railway of that length would give access to that whole Mackenzie River Basin by navigation? A. Midway between Athabasca and Great Slave Lake there are the five rapids I have spoken about, but a railway about twenty miles in length would overcome that.

Q. What is the distance from Prince Albert to the navigable waters in the north? A. I cannot say exactly. The best way would be to ascertain the distance on the map.

By Honorable Mr. Girard:

Q. In the construction of a railway would there be any engineering difficulties to overcome? A. There are a good many swamps.

Q. A gentleman who did not hear you yesterday wishes to elicit this: you state that a large portion of the country is fit for cultivation if there was a railway into it. You gave us two routes by which a railway could be constructed. You said that one of these lines would be from Prince Albert striking the Athabasca at Clearwater River? A. Yes.

Q. That would give the whole navigation of the Great Slave River and Lake and of the Mackenzie River, with only a break of 20 miles. The other route you mentioned was between Edmonton and Athabasca Landing, a distance of 90 miles: that would give you access to the whole of the navigation with the exception of 70 miles of broken water on the Athabasca River, and this 20 miles that you speak of? A. Yes, if a railroad was made from Edmonton to Smoky River by the way of Lesser Slave Lake, the distance would not be very great.

By Honorable Mr. Girard:

Q. Would it be an easy road to build? A. Yes, I think so. On the Peace River at Vermillion there are two falls, but one of them is very trifling. There is really only one obstruction but it is not much.

Q. What is the length of the portage there? A. It is very short. When the water is a little high it is about twice the length of this room.

Q. What is the name of that place on Peace River? A. They generally call it the Falls at Vermillion.

By Honorable Mr. Kaulbach:

Q. What is the height of the fall? A. On the left side it is about two feet.

By the Chairman:

Q. What is the length of the obstruction on the Athabasca River? Mr. Christie said about 70 miles. What do you say? A. At the Grand Rapids in the middle of

of the river there is an island and there are two channels. The channel on the right side could be easily opened. There are large stones, but they are generally of a sandy nature and these could be removed. I think it would be easy to make a route there. I travelled with the Captain of the "Graham" and he told me that he passed there many times and that he thought it would be easy to make a route. He said: "If they would give me the means to make a route there for the steamboat I would do it."

Q. If you had ten tons of freight at Edmonton, how would you take it to Fort Hope? A. From Edmonton by waggon to Athabasca Landing. From Athabasca Landing descend a good navigable river as far as the Grand Rapids. Athabasca Landing is near Lac la Biche. Generally we have small Hudson Bay boats to descend the rapids, but flat boats would be better. At the Grand Rapids, generally we carry the freight about a mile overland. Below that there are plenty of rapids and they can be run except the rapids that they call the Falls, not far from Fort McMurray—about 20 miles above Fort McMurray. The fall is not high and it would be very easy to improve it.

Q. What distance have you to portage at the falls? A. About the same as at the first portage—about one mile. If the water is high, we can pass down without portaging, when the water is high we can run it with half the cargo: in low water we have to portage the whole of it.

Q. What is the whole distance of broken navigation on Athabasca River? A. The obstructions are in places; there are four or five rapids.

Q. If you wanted to build a waggon road to carry the goods down past these obstructions how long would that road be? A. It would not be very easy to make a road at the Grand Rapids, because the banks are high, but the island between the two channels is flat and it would be very easy to make a road there.

Q. What would the length of that road be? A. The portage would be shorter—about half a mile.

Q. You say that a steamboat can go down to the head of the rapids? A. Yes.

Q. And that another steamer comes up to the foot of the rapids? A. Yes.

Q. What is the distance between those two steamers? A. As I said just now we have the falls, at some seasons the steamer can run up there. The portage would be about 70 miles altogether. I have passed there twelve times. Four or five times I travelled all the way and in winter I drove my dogs.

Q. You have told us very little in your communication about the wood buffalo? A. They are very scarce.

By Honorable Mr. Girard:

Q. Have you met many in your long life among the Indians? A. No; but I have eaten the meat of the buffalo. I have never seen it; I have seen the prairie buffalo, of course, but the wood buffalo are not numerous now.

Q. Have you met the musk ox in the country there? A. No, I have never been in their land.

Q. You have spoken of parts of that country as being good for agriculture, have you gardens there? A. We have gardens at nearly all our missions. We have potatoes, carrots, beets, cabbages, turnips and lettuce—everything that will grow rapidly and is hardy will grow well there.

Q. How far north? A. At every mission, even at Fort Good Hope they raise turnips and potatoes.

Q. And carrots? A. Yes, but they are very small.

Q. Cabbages? A. No. We get cabbages at Providence and on Peace River; they are very large.

Q. Do you raise onions also? A. Yes.

Q. Do you raise flowers, and what kinds? A. We have wild roses in abundance as far north as Good Hope.

Q. Can you raise asparagus there? A. We have never tried.

By Honorable Mr. Macdonald (Midland) :

Q. Your lordship said that the road from Prince Albert to Fort McMurray would pass through swamps; are those swamps extensive? A. There are many swampy places, but you could get around them.

Q. It is expensive to construct a railway through a swampy country. I would like to know what proportion of that route would pass through swamps? A. I passed only once by land during the summer when the water was high.

By Honorable Mr. Girard :

Q. Is the water in the swamps very deep? A. No.

By Honorable Mr. Sanford :

Q. You are acquainted with agriculture in Quebec and in this province. How does it compare with the agriculture in that northern country. That is to say, will a man in Quebec do any better farming than he would in that country if he had railway facilities? A. He would do better in Quebec.

Q. Do you think the two countries are equally good in this respect? A. No; because that country is too cold, and there are summer frosts. It is not a good country for farming.

By Honorable Mr. Girard :

Q. Do you think grapes could be grown there at any time? A. No.

By Honorable Mr. Sanford :

Q. Does your remark apply to the whole of that country? A. The Liard and Peace and the Athabasca Rivers are good for agriculture, but only along the banks.

By Honorable Mr. Macdonald (B.C.) :

Q. You think that along the banks of the Peace River and back to the extent of two or three miles it is good? You can really grow grain there as well as in Quebec? Is it as certain a crop? A. There are many points where the soil is alluvial that are very good for crops. We raise splendid wheat there.

By Honorable Mr. Girard :

Q. Would a farmer cultivate the ground to as good advantage there as in Quebec, if he had railway facilities? A. In general I think not. There may be chances along the banks of the rivers. Yesterday I was speaking on the subject to Sir Donald Smith, who knows the country well, and he was of the same opinion.

By Honorable Mr. McInnes :

Q. Are you certain of a crop there every year, or how often have you a good crop in the Peace River country? A. Above Vermillion on the Peace River I think nearly every summer they are sure of a crop.

By Honorable Mr. Girard :

Q. But they are exposed sometimes to injury from frost? A. They are exposed to injury from dry seasons.

By Honorable Mr. McInnes :

Q. Are the crops there more subject to be injured by frost than they are say in the Province of Quebec? A. I think not. I think that in the upper Peace River country they are not. At Vermillion the land is high, and often crops have been frozen there.

Q. What is the average width of the low valley of the Peace River where those crops can with comparative safety be grown? A. An average of two miles on each side.

Q. And for what distance? A. I do not know. I have never been far up the river. I never went further than Dunvegan, but at Dunvegan the land is good up nearly to the mountains.

By Honorable Mr. Girard :

Q. Are all your missionaries employed there in teaching the Indians? I suppose there are far more Indians than whites—what is the proportion? A. The Indians are more numerous except at Lac la Biche. In all that Mackenzie River country there would only be about fifteen hundred white people: all the rest are Indians.

Q. Among the white people do you include the half-breeds? A. Yes.

Q. I suppose they are pretty numerous there too? A. No.

Q. They are more numerous at Lac la Biche? A. Yes, the country is largely yet a wilderness.

The Committee adjourned until Monday.

SENATE, COMMITTEE ROOM, OTTAWA, Monday, 23rd April, 1888.

Answers from ROBERT BELL, M.D., LL.D., B.A.Sc., Assistant Director Geological Survey of Canada, Ottawa, were read as follows:—

Series A.—Relating to Navigation and Communication.

1st Question:—The following answers refer to the region west of Hudson's Bay, from its shores nearly to the Rocky Mountains, and from the Saskatchewan to the head of Slave River.

The information is derived from personal observation.

2nd Question:—A. Saskatchewan and its north branch, navigable from Grand Rapids at its mouth up to Rocky Mountain House. Nelson River for 50 miles from head of tide; again for 150 miles (with only one break) in the central part of its course and also for about 40 miles from the outlet of Lake Winnipeg; Hayes, Steel and Hill River (all parts of the same stream) for 120 miles following their general curves. Beaver River from Isle à la Croix Lake to Green Lake River with one rapid, a distance of 80 miles, and it is said to be navigable for a long distance further up; and at high water the navigation extends into Green Lake. Athabasca River from Lake Athabasca to Mountain Rapid, eight miles above Fort McMurray, in all about 150 to 160 miles by the river. Then by 47 miles of land carriage Grand Rapid is reached. From this rapid to the junction of La Biche River is 100 miles of good navigation, and the same is said to extend up to the outlet of Lesser Slave Lake.

3rd Question:—A. A road, fifty miles long, from Sucker Creek on the North Saskatchewan running N.N.W. would connect with Athabasca Landing on the Athabasca River. Another road 47 miles in length from the head of Grand Rapid (on the Athabasca River) to the foot of Mountain Portage on the same stream would connect its two navigable stretches. A road from the North Saskatchewan to the upper part of the Beaver River would be of service in the colonization of the country on either side of the latter until railways are built. A railway carried northward from the existing system as far as the junction of the Clearwater with the Athabasca would give access to an immense extent of country which could then be reached by navigating the waters which lie to the northward and are connected with the Lower Athabasca.

4th Question:—A. Athabasca Lake, 192 miles long, according to the track-survey of my assistant, Mr. A. S. Cochrane, in 1881, and which is the only attempt at a survey heretofore made. The country to the south of it is level, wooded and mostly fertile, while on the north side it is rocky, hilly and mostly barren. The water appears deep and is clear, except at the west end where the muddy water of the Athabasca is received, and also part of that of the Peace River at high water. Lac la Biche, 24 miles long, according to my own track-survey, lies in a shallow alluvial basin and is surrounded by good land of a nearly level character. Isle à la Croix Lake lies in a low sandy region and is a sort of collecting basin for the waters from all directions except that of its outlet. From its south end the distance is 36 miles to the extremity of either of its arms; or continuing into Buffalo Lake there would be 74 miles of navigation, besides Clear Lake off Buffalo Lake. Cree Lake between Methy Portage and Athabasca Lake, is 40 miles long, and Green Lake from my own survey is 18 miles long. Reindeer Lake according to the track-survey of my assistant, Mr. A. S. Cochrane, is 165 miles long. Great Slave Lake, according to the sketch-map of Franklin, &c., is just 300 miles long (Lake Superior 360 miles in length). Great Bear Lake, from similar authorities, is 190 miles long and 110 miles wide. Wollaston or Hatchet Lake is about 70 miles long and nearly as many miles wide.

6th Question:—A. There is no obstruction to steam navigation on the Athabasca until the foot of the Mountain Rapid is reached. This is eight miles above Fort McMurray, or the Forks. Other rapids follow at intervals to the Grand Rapid, forty-seven miles in a straight line. There is a difference of opinion as to whether a powerful light draft steamer could or could not force her way at some stages of water up to the head of the Grand Rapid. This interval is easily navigated by York boats and I have come all the way down it in a bark canoe. The rapids are over either boulders or a sandstone bottom.

7th Question:—A. The Athabasca below the Clearwater is now navigated by a flat bottomed steamer built at Fort Chippewyan in the winter of 1882-83, under Capt. Smith and Engineer Littleberry. The Little Red River, the Tar and the Moose Rivers, affluents of the Athabasca below the Clearwater, might be navigated for some distance by small steamers. The country through which they flow is said to be fertile. The Clearwater is navigable for steamers only to the foot of the first rapids. These rivers are fully described in my report to Government for 1882.

11th Question:—A. The Beaver River, from the Great Bend at which it is joined by the Green Lake River, is a large stream navigable for steamers downward to Isle à la Crosse Lake, except, perhaps, at one place, the Grand Rapid, at low water. Above the Great Bend it is narrower, but is said to be uninterrupted by rapids nearly to the western boundary of the district of Saskatchewan. The lakes along the upper part of the Churchill River are described by Mr. Cochrane and other explorers as being very irregular in shape, full of islands, and bounded by hilly, rocky shores. The rocks consist of gneiss of the Laurentian system.

13th Question:—A. The total length is 192 miles, according to Mr. A. S. Cochrane, who made a track survey of it in 1881, under my instructions. The country on the south side is described as level and well wooded, with nearly horizontal rocks along the shore, while on the north side it is hilly and rocky (Laurentian), the timber small and much of it burnt. As to economic minerals, magnetic iron, apparently of fine quality, judging from specimens I obtained at Fort Chippewyan, is found near the entrance of Black Bay, on the north side. Graphite has been found in loose pieces near Fond du Lac Post on the same side. Mr. Cochrane found the Huronian foundation, which is always apt to be metalliferous, well developed in Black Bay, and again between Fond du Lac and the eastern extremity of the lake. The lake is deep and navigable for steamers of a large class, except a few miles at the eastern extremity where it may be rather too shallow. At the west end the waters are muddy, owing to the influx of the Athabasca and in some seasons part of the Peace River, but the rest of the lake is clear. The ordinary fish of the northern lakes abound, such as whitefish, grey trout, pike, pickerel, &c., &c.

16th Question:—A. Cree Lake is a large sheet of water, first indicated on the maps by myself in 1882. It is about 40 miles long, and is situated just north of the height of land and two-thirds of the distance from the outlet of Isle à la Crosse Lake and the east end of Athabasca Lake. It discharges into Back Lake, the first one east of Athabasca Lake.

19th Question:—A. Yes, I have been around parts of it. The whole west coast of both Hudson's Bay proper and James' Bay is low with shallow water, from Chesterfield Inlet to Moose River at the south end. Mud, sand and gravel, with boulders in some places, form the shore, except between Chesterfield Inlet and Eskimo Point, and from Seal River to Cape Churchill, where solid rocks occur. The only harbor available for large vessels at all stages of the tide is that of Churchill, where perfect shelter with easy entrance is found, with from 6 to 8 fathoms of water. The entrance of the harbor was commanded by Fort Prince of Wales up to 1782, when it was captured and destroyed by Admiral Le Perouse.

20th Question:—A. The principal lakes known are Aylmer and Artillery Lakes, North-lined Lake, Cree, Wollaston, Reindeer, North and South Indian Lakes on the Churchill, and Split Lake on the Nelson River. Aylmer and Artillery Lakes are described by Richardson, Back, Sutherland, Anderson, &c. North-lined Lake by Hearne. Wollaston, and Reindeer Lakes are known by Mr. A. S. Cochrane of the

Geological Survey, Ottawa. Nothing appears to be known as to the North and South Indian Lakes beyond their size as given by Arrowsmith. A track survey of Split Lake was made by myself in 1879. It is an expansion of the Nelson River and lies about midway between Lake Winnipeg and Hudson's Bay. It has a length of 25 miles and a width of from 2 to 3 miles. Its elevation is 440 feet above the sea (by barometer). The outline of the country seen around Split Lake is generally even, but it presents minor undulations. The country all around is overspread with a brownish clay.

22nd Question:—A. Dr. Percy W. Mathews, of York Factory, has written a paper on "Frost Penetration" in these latitudes which I can submit to the Committee.

24th Question:—A. This question is best answered by the accompanying map. By the term barren grounds is not meant the rocky and sterile lands as compared with the fertile, but the territory beyond the limits of timber, and they are not necessarily more rocky than some parts of the wooded regions.

25th Question:—A. They are like much of the rest of the country except that no trees grow, owing to the rigor of the climate. Large tracts are level or nearly so and covered with stones, gravel, sand and clay. Moss, lichens, sedges, grasses and small flowering plants grow on those lands and in places dwarf willows. Ledges of rock run in various directions, and lakes and ponds abound. They are the breeding grounds of wild fowl and the home of the musk ox and the small reindeer or barren ground cariboo.

26th Question:—A. Barley as far as Fort Simpson on the Mackenzie, and potatoes, I understand, to Fort Hope. Potatoes are grown every year at York Factory, and they have been grown at Churchill, but are an uncertain crop there.

27th Question:—A. In the eastern part of the region, wheat ripens well at Norway House and around Little Playgreen Lake. Barley ripens at Oxford House. As far as Fort Providence, I understand, but the fact of its ripening in this latitude may depend on the proximity of heated water which keeps the air in the neighborhood warm, and so prevents the early autumn frosts. I have seen excellent wheat ripen at Lac la Biche where it is said to be a sure crop every year, but this is owing to the above cause.

28th Question:—A. The most northern points at which I have seen Indian corn attempted are Fort Pitt, on the Saskatchewan, and at Osnaburgh House at the outlet of Lake St. Joseph at the head of the Albany River.

29th Question:—A. North of the North Saskatchewan barley ripens about the 15th of August and wheat a week later. They are sown as soon as the snow is off the ground, the land being prepared the fall before.

32nd Question:—A. Along the North Saskatchewan and at Lac la Biche wheat ripens about the 20th to the 25th of August; barley the 15th of August; potatoes 1st of October; turnips the 15th of October.

33rd Question:—A. In the Athabasca region, rainy in beginning of June, but after that mostly fine and warm till the end of August.

34th Question:—A. Yes, except near the larger lakes, and close to the larger rivers.

36th Question:—A. Draining and cultivating the land will tend to diminish summer frosts.

38th Question:—A. Generally rainy in September. In October the weather is fine some years, but in others it is cold and rainy.

40th Question:—A. In the country I traversed between the North Saskatchewan and Lac la Biche the grasses were the most luxuriant I ever saw, being often six feet high. In the Athabasca region luxuriant grasses and sedges grow in the marshes and around the lakes. In the region of Isle à la Croix and the lower part of the Beaver River, the soil is sandy and the grasses poor. The same remarks apply to the northern portion of the district between Green Lake and Fort Carleton.

41st Question:—A. Abundantly in the prairies and the openings in the woods between the north Saskatchewan and Lac la Biche. Also around Lake Winnipeg and along the Nelson River.

43rd Question:—A. Between the North Saskatchewan and Lac la Biche, it is mostly sand and a rich sandy loam. In the Athabasca Valley, below the Clearwater, a light sandy loam. Around Lac la Biche, clay on top of sand, and along the Athabasca, above Grand Rapid, mostly clayey soil.

In the valley of the Nelson River and those of the adjacent streams, brownish and light color clays prevail, which are fertile on the lower levels, but stiff and hard on higher levels.

44th Question:—A. This question is best answered by accompanying map.

45th Question:—A. It is a climate of considerable extremes of temperature. Only the most hardy forest trees grow there, and the number of species diminishes till only one, the spruce, remains.

Herbaceous plants are growing luxuriously in the early summer where only a few inches of the surface of the soil have been thawed.

47th Question:—A. I have a record of temperature at Norway House kept some years ago, which has never been published.

Also record of the weather, seasons, periodic events, &c., kept at Martin's Falls on the Albany, extending back from 1887 for about 50 years still unpublished.

48th Question:—A. They exert a very marked influence in this way. I have noted many facts illustrating this around most of the larger lakes I visited in the north, also along numerous streams both in the prairie and wooded regions.

49th Question:—A. Around Lake Winnipeg the prevailing winds in summer and autumn are from the southward, and they have a beneficial influence on the climate to the northward. There is also a great deal of southerly wind around Hudson's Bay in summer.

51st Question:—A. Some attempt at agriculture and stock raising has been made at almost every Hudson Bay Co.'s and Mission post. Cattle and horses always appear to thrive. Potatoes were the commonest crop grown and although always planted in the same soil year after year, they never failed to do well. Nearly all the root crops and vegetables usually grown in other parts of Canada have done well wherever they have been tried.

52nd Question:—A. Horses, sheep, cattle, goats, &c., would find abundant pasture in the better places during summer and hay might be grown for them in the same regions. This has been illustrated at Churchill where excellent cattle thrive. In Iceland, cattle, horses and goats are raised under worse circumstances, and domestic animals at the Moravian Mission Stations along Eastern Labrador.

53rd Question:—A. *Cariboo*.—Reindeer or the "Barren Ground Cariboo" range in countless numbers over the open country in summer, and migrate towards the shelter of woods in the winter. Flesh and skins valuable. Might be domesticated as in Norway, &c.

Musk Ox.—In small herds throughout the barren grounds and on all the large islands of the Arctic regions as far as man has penetrated. Valuable for their skins as robes.

Wood Buffalo.—Small numbers still remaining east of the Athabasca and west of Slave River.

Moose.—Found everywhere in the Athabasca-Mackenzie region and south-eastward to Lake Winnipeg. Becoming scarcer every year, owing to indiscriminate slaughter.

"*Elk*," *Biche* or *Red Deer*.—Inhabits the half-wooded country of the Saskatchewan and Athabasca Basins.

54th Question:—A. *Lynx*.—Numbers vary greatly at the same place, killed by shooting, snaring, &c.

Arctic Fox.—Much more numerous some years than others. Often caught in "dead-falls," made of ice. Also killed by shooting, poisoning, spring traps, &c.

Black Fox, *Silver Fox*, *Cross Fox*, *Red Fox*.—All varieties of the same species. The rarest is the black or darkest variety of the silver fox. The cross fox is lighter than the last. The red is the commonest of all—killed by dead-falls, spring traps and poisoning.

Fisher.—A very generally diffused fur-bearing animal but nowhere abundant. Fur a very handsome dark gray to black on the greater part of the animal's body.

Wolverine.—Called by the Cree Indians "the devil," and by the French-Canadians the "carcajou." Very cunning and destructive.

Otter.—Extends northwards to the verge of the forests—most abundant where fish are plentiful.

Beaver.—In every part of Canada (except the naked plains) from the Rocky Mountains to the Labrador coast, and about as far north as trees extend.

Marten.—Everywhere throughout the Dominion, north to the limits of trees.

Mink.—Same range as the marten.

Ermine.—Extends even beyond the limits of timber. Said to be found north of Hudson's Straits.

Musk Rat.—The most common of our fur-bearing animals, but does not extend north to the limits of timber except in some places.

Polar Bear.—From all around Hudson's Bay even to south extremity of James' Bay, occasionally.

Grizzly Bear.—The so-called "grizzly" of the North-West is said by some not to be the true grizzly but the "silver bear."

Black Bear.—The black and cinnamon bears are believed to belong to the same species, the latter being a western variety. The black bear is found everywhere in the eastern part of the continent from the Southern States to Labrador. It does not extend to the limits of trees in the north.

57th Question :—A. The fishes are the same in all the great northern and north-western lakes, the most generally diffused and useful being the whitefish, next is the grey or lake trout, from 10 to 20 lbs. in weight, and sometimes 50 lbs. and upwards. In most of the lakes and in the rivers communicating pretty directly with the sea, sturgeon are generally found. Speckled trout occur in the streams flowing into Hudson's Bay. Salmon of two species are caught in rivers and on the coast from Churchill northward. Salmon of great size are taken about the mouth of the Great Fish River from which its name appears to be derived.

Nearly all the fresh waters contain pike and the pike-perch or pickerel, and many of them the yellow-barred perch, but bass do not appear to extend beyond Lake Superior's tributaries.

The mari, methye, or fresh water ling or dog-fish, occurs in nearly every lake of large size, and suckers of two or more species are met with in nearly all fresh waters.

58th Question :—A. The larger whales, having been so much hunted in all the more accessible waters, have taken refuge in later years in the Gulf of Boothia or Boothia Bay, whither, however, they are now pursued by the whalers.

62nd Question :—A. The wooded region extends south-westward from a line drawn almost straight north-westerly from the mouth of Seal River on Hudson's Bay to the mouth of the Mackenzie River. The most northern species are spruce, tamarac, aspen, rough-barked poplar, white birch, balsam, Banksian pine. Spruce and tamarac attain a good size in the more southern parts of the region under investigation, and might some day be sent south to the prairie country south of the Saskatchewan by railway.

The northern limits of the principal timber trees of the Dominion were described and mapped by myself in 1881, in connection with the Geological Survey.

65th Question :—A. Everywhere in the wooded regions and in some parts of the barren grounds the Labrador tea-plant exists. It is but little used for any purpose.

66th Question :—A. It is a very poor substitute for the Asiatic tea and does not possess the stimulating properties of the latter.

67th Question :—A. See a paper by the writer, on the Economic Minerals of the Hudson's Bay territories read before the American Institute of mining engineers in 1886, and published in the report of the second Hudson's Bay expedition in the same year by the Department of Marine, Ottawa.

Gold has been found in many places in the region between Mackenzie River and Alaska, at Repulse Bay and near Chesterfield Inlet, Hudson's Bay; also at Burntwood Lake near Frog Portage. Nuggets of native silver have been found in the upper Peace River.

Copper.—Native copper on the Coppermine River, and copper ore on the west coast of Hudson's Bay. Clay iron-stone on the Athabasca River above the Clearwater and magnetite at Black Bay on Athabasca Lake. Sulphur is abundant in the form of pyrites on the west coast of Hudson's Bay. Salt, in springs on the Clearwater and the Athabasca, and copiously on the Salt River on the west side of Slave River. Petroleum and asphaltum on the Athabasca River, Peace River towards Dunvegan, Great Slave Lake, Mackenzie River, &c. (See paper by myself in the *Canadian Journal*, Toronto, for 1881.)

Gypsum, at Peace Point, Peace River, also said to occur at the Salt Springs, Salt River just mentioned.

Lignite, along the Athabasca River, Mackenzie River near Great Bear Lake River, along Peel's River and on the coast of the Arctic sea on both sides of the Mackenzie.

Plumbago.—Loose, near Fond du Lac, Athabasca Lake.

68th Question:—A. Clay for brick at Lac la Biche, along the Biche and Athabasca Rivers; moulding sand on Athabasca River below Grand Rapids. (See report for 1882); good limestone along Athabasca River from Crooked Rapids to Little Red River, and on Isle à la Croix Lake, also between Cumberland House and Beaver Lake, and throughout the country for a long distance east and west of this section. Granite is mentioned by travellers on the lakes between Frog Portage and Isle à la Croix Lake—also on the north side of the Great Slave Lake. Père Petitot mentions it in several places east of the Mackenzie River.

70th Question:—A. The Canada goose breeds in large numbers on the barren grounds north-west of Hudson's Bay, also in the wooded regions to the south of the barren grounds. The laughing goose in the valley of the Mackenzie and towards the sea coast. The snow goose or wavey in the low country east of the Mackenzie delta and in unknown places to the north. The grey or stock duck in the wooded regions between Hudson's Bay and the Athabasca-Mackenzie.

71st Question:—A. Canada geese, waveys and stock ducks are considered of the most value in the spring and fall migrations.

72nd Question:—A. Great numbers stop to feed in autumn in the shallow waters and marshes about the west end of Athabasca Lake and in those along the lower parts of the Peace River. Also on the west coast of Hudson's Bay, especially between Seal and Churchill Rivers and opposite Nelson Shoal.

73rd Question:—A. Berries, seeds of grasses, &c.

74th Question:—A. They follow the opening of the water in the spring as they go north and leave with the first signs of ice in the autumn.

75th Question:—It has immense prospective value, and is probably the greatest source of wealth which can soon be realized, in the region under consideration. Full particulars can be furnished in connection with Prof. Peckham's report on the value and uses of the bitumens of that region.

81st Question:—A. A study of the composition of the drift and of the *striae* indicating its course, together with a better knowledge of the general nature of the rocks *in situ* to the northward would enable us to say pretty certainly what has been the probable sources of this gold.

OTTAWA, 23rd April, 1888.

DEAR SIR,—I have to request on behalf of the committee that you will give me, approximately, the length of coast line on the Hudson Bay and the Arctic Sea, which may be accessible to steam sailing craft. Second, please also give me, approximately, the length of the navigable coast line, that is both sides of the Lesser Slave Lake,

the Athabasca Lake, Great Slave Lake and Great Bear Lake. Third, give me, approximately, the total lake area of the whole country, irrespective of navigation. Fourth, give me the total river navigation, independent of the breaks, of the main rivers and their branches; how much of this adapted for stern wheel steamers and how much for craft drawing more water. Fifth, give me, approximately, the area in square miles fitted for the growth of potatoes, wheat, barley. Sixth, give me, approximately, the whole pastoral area, then divide this into what is prairie and what is wood. Seventh, give me the total area of barren grounds.

Give me a complete list on separate paper of all the fish found in the district. Second, of all the forest trees. Third, of all the minerals. Fourth, of all the animals, and fifth, all the flora of the region.

Yours very truly,

JOHN SCHULTZ,

Chairman.

ROBERT BELL, M.D., LL. D.,
Geological Survey, Ottawa.

Prof. BELL called and examined.

By the Chairman:

Q. What is the extent of the barren grounds? Have you ever seen the region yourself, and if so describe its appearance? A. The barren grounds may be said to include the whole of the mainland of the continent and the islands of the northern sea to the north-eastward of the limits of timber which are marked on the map. The line is indicated here as running from the east coast of Labrador westward, and from the west shore of Hudson Bay north-westerly to the mouth of the Mackenzie River. I have had opportunities of seeing these grounds myself in many places in the Labrador peninsula and on both sides of Hudson's Straits; also on the east and west sides of Hudson's Bay on the islands north of the straits. I have photographed them in different places.

Q. Have you spare copies of these photographs that you can supply to the Committee? A. I have only one set myself, which I now produce.

Q. In the region that we have under consideration can you give us an idea of the general proportion and position of arable and pastoral lands as compared with the sterile parts, irrespective of climate. A. It may be most graphically seen perhaps by this map. I have represented it in red on the plan. As you will observe the proportion of good land in the North-West Territories, extending from Manitoba to Mackenzie River is very great as compared with all the similar lands of the older provinces.

Q. How much more of that class of land is there in the North-West than in the older provinces? A. It might be estimated, but glancing at the map I should say it is at least twenty or thirty times greater. That is just a rough estimate by the eye on this map (map herewith submitted) irrespective of climate. The map shows the arable and pastoral lands of the whole Dominion. It might be said that its vast extent is of no consequence because part of it is too far north. That may be, but this shows the land irrespective of climate.

Q. What is the nature of the soil between the North Saskatchewan and Lac la Biche? A. A great part of it is remarkably fine. There are sandy and bouldered tracks, but of less extent than the good land. Most of it is a rich black loam, that is between Fort Pitt and Lac la Biche.

Q. There is a map of yours on the wall indicating the northern limit of trees; do you still think that map is correct? A. Yes.

Q. It is dated 1884. Have you any reason to change the lines showing the limits of any of the trees from information that you have since received? A. No, except in one or two minor details. This map shows the northern limits of upwards

of thirty of our forest trees. The greater number of them or those in the more southern regions I have had opportunities to trace in detail. It has been my business for thirty years to traverse this region, and I have always made a study of the distribution of timber trees, and consequently I say this map is mostly from my own observation. There are perhaps four or five species, the most northern ones, which I have not traced out in the Mackenzie River country, but I have had opportunities to trace their distribution in the east and in the country between Manitoba for example, and Hudson's Bay. A preliminary edition of this map was published in my report for 1880, a copy of which is on the table, and the lines were copied from it, without acknowledgment, upon a map published by the Department of Agriculture in 1886. The United States authorities were more just when they made use of the same work. In the letter of transmittal of Professor Charles S. Sargeant's great "Report on the Forests of North America," being Volume IX of the United States Census of 1880, this gentleman says: "The information in regard to the distribution northward of the trees of the eastern United States is entirely derived from Dr. Bell's paper upon the Canadian Forests, published in the report of the Geological Survey of Canada for the years 1879-80." Referring to the same paper and accompanying map, the same gentleman elsewhere says: "Dr. Bell has made a contribution in them to botanical and forest geography, whose worth can hardly be overestimated."

Q. In estimating the area for the purpose of the Committee, you think that we might safely take the limits as given on this map of yours? A. Yes; they are practically correct. They could not be materially altered in any part, I think. Of course here and there one of these lines might be shifted a little locally, but in general, the aspect of this map could not be altered. It is sufficiently correct for all practical purposes, and these tree lines are absolutely correct, so far as most of them are concerned. On the title of this map I mention that these were mostly from personal observation, which I still maintain. The piece of paper you observe was pasted over those words at the London and Colonial Exhibition. I do not know why, because it is as much a part of the title of the map as the rest of it. This map is not printed; it is drawn by hand, and is my own private property.

Q. What is the most important crop at present cultivated in the great northern region of Canada which you have visited? A. The potato is the most important and the most general. It is easily raised, produces a large amount of food, and grows well at nearly all the Hudson Bay Company's posts, at all in fact, excepting the extreme northern ones. Indeed, I do not know anywhere they do not attempt to cultivate it, but it ripens perfectly at the most of them.

Q. You were requested by the Committee some time ago to indicate on a small map that was sent to you the range of cultivation of the potato and barley? A. I submit this small map. I have looked over my notes carefully and also consulted others as to the growth of the potato through the whole region from the Atlantic coast to the Mackenzie.

Q. Does it also indicate wheat and barley? A. It shows, as accurately as we can show it, not only the area of potato culture but also that of barley and wheat. I say "the possible cultivation of barley and wheat" but the known limit of the cultivation of the potato. Grains have been known to ripen as far north as indicated there, but I could not say that these grains are always a sure crop.

Q. How far may hay and root crops suitable for wintering cattle be grown? A. Some root crops, such as turnips especially, will grow even north of the potato. Hay grows within the limits of the barren grounds, so that cattle may be kept and fed on what the country produces even north of the limits of the potato. There are examples of cattle thriving north of the limit of the potato, for instance at York Factory and at Churchill. Cattle are raised and bred from year to year and do well, and excellent butter is made beyond the limits of the ripening of the potato. Potatoes are grown at Churchill, too, but do not always ripen.

Q. You were also asked to indicate on a map similar to this those portions of the rivers in that country that were suitable for steam navigation; have you done so?

A. Yes, on this map which I have laid on the table I have indicated in red lines the navigable stretches of all the rivers west of Hudson's Bay as far west as the mountains and also indicated the lakes which are navigable.

Q. Then we may regard that as correct? A. Yes. This shows a vast mileage of navigable waters on the rivers and lakes. There are many smaller lakes which would be navigable for steamers, but on this scale they would not be conspicuous.

Q. His Lordship Bishop Clut informed us that between the source of the Mackenzie and the Arctic Ocean—I am now alluding to the tributaries as well—there were only three breaks. He said that one occurred at Fort Smith on the Great Slave River; that it was twenty miles in length, or rather that a road which was built there twenty miles long, enabled the Hudson's Bay Company to transport goods around that break. Then he said there was a series of rapids and obstructions on the Athabasca River above Fort McMurray, which a road of 70 miles would completely pass. He said, if I recollect rightly, that barges could descend this portion of the Athabasca and that a steamboat could possibly do so, but could not be got up again. Then he said at Fort Vermillion or below it there was a fall on the Peace River, the portage of which would be about one mile in length. Do you know of any other breaks in the navigation? A. No; as far as my own knowledge of the country goes, and from descriptions of travellers these are the only breaks. I have myself gone down the somewhat broken part of the Athabasca River, and it may be 70 miles in length following the river, but it is only 47 miles in a straight line. I passed all those rapids from the head to the bottom. A road 47 miles in length, in a straight line, would clear the whole of them, but the intermediate portion of the river between the head and the foot is not all unnavigable. It is not all broken water. You could take York boats up and down there at all seasons of navigation. Some men connected with the steam boating for the Hudson Bay Company on the Athabasca say that they think the whole of the reach is navigable at certain seasons of the year, and that a powerful steamer could be forced up the river in high water. Certainly it could descend the river at high water. There is nothing to prevent a strong steamer running it in high water. Some of the most experienced men connected with this pioneer steam navigation think they could run a steamer up. This shows that the descent is not very great. The most formidable single rapid is the one called the Grand Rapid.

Q. What is the break on the Peace River—is it a fall? A. I have not been at the place myself. It is about 50 miles below Fort Vermillion. There are only three breaks in the Athabasca, the Peace and the Mackenzie River.

Q. What are the greatest lakes connected with the Churchill River? A. Of the larger lakes at the head of the Churchill River, after leaving Methy Portage, which crosses the height of land, the first to the southward is called Lac la Leche; then we come to Buffalo Lake and next to Clear Lake, which is a north-easterly arm of Isle à la Croix Lake. These last three—that is, Buffalo Lake, Clear Lake and Isle à la Croix Lake—are the continuations of one lake, as it were. There are narrow places separating them, but practically they are but one lake.

Q. Would you send the Committee a communication giving approximately the whole lake surface in the Mackenzie Basin, within the scope of our enquiry? A. I might, but the lakes not being surveyed, with the exception of Lake Athabasca, I could only give it approximately. The whole east and north shores of Athabasca Lake were surveyed in a manner by an assistant of mine, Mr. A. S. Cochrane, and we have his map in the office, so that we could give a pretty good estimate of the area of Athabasca Lake.

Q. And the other lakes? A. We would have to take that from other sources.

Q. What are the most important rivers on the west side of Hudson's Bay with respect to navigation—I mean the rivers flowing eastward into Hudson's Bay? A. Perhaps the river which would afford the greatest length of continuous uninterrupted navigation from the sea is one which heretofore has not been known to geography at all. It is not even mentioned on the map. It is known as the Attawapishkat.

Q. What is the signification of that? A. It is said to mean the trader's river of the swampy country. It enters James' Bay about 65 miles north of Fort Albany and is continuously navigable from the sea at high water as far as it will afford width for steamers—which would be perhaps 250 or 300 miles. I came down the whole length of that river without once taking my canoe out of the water. Within 100 miles or so of its source there is a large lake, for which the Indians have no specific name. The Indian chief to whom I spoke about it simply called it "my big lake." We named it after Lord Lansdowne. Having made a track survey of it, I had to give it some name, for the convenience of description. It measures 13 miles in length, and over ten miles in width. Just below Lake Lansdowne is another lake nearly as large, called Attawapishkat Lake.

Q. Are there any salmon in that river? A. There are no salmon in that river.

By Honorable Mr. Sanford:

Q. Does that river run directly north or west? A. Its general course is eastward, but it is not straight at all. It makes some large bends. The Albany is next in point of length of navigable water. It is navigable for about 250 miles from the sea by river steamboats at high water. The Moose River and its branch the Missinaibi would be navigable for about 120 miles from the sea also at high water. The Kaipishcoow and Equan Rivers, also on the west coast of James' Bay, would be navigable for a considerable distance by steamers. On the south-west side of Hudson Bay proper the Wainisk and Severn Rivers are navigable for a limited distance. The Hayes, Steel and Hill Rivers which are all parts of one river are navigable for about 140 miles altogether from the sea. The great Nelson River would be navigable only for about 50 miles from the bay.

By the Chairman:

Q. Is the west side of Hudson Bay well adapted for coast navigation? A. No, it is not. The water is very shallow in nearly all parts.

Q. You were requested by the Committee to indicate upon the map the sea animals that were found on the northern and eastern sea coasts of the district that comes under our purview here for investigation. If you have not already done so we would like you to indicate on the west coast of Hudson Bay and on such parts of the Arctic Ocean as are accessible north of the Hudson Bay and in the neighborhood of the Mackenzie River, east and west, the sea animals that are found, indicating in some way or another, whale, seal and porpoise, if there are any? A. I have already done so on a map, upon the same scale as those already submitted, but I have left it in my office to complete the title this morning.

Q. We also wish to refer you to the Admiralty Chart which we have in the room here, of Behring Straits, and also the Arctic Ocean between Behring Straits and the mouth of the Mackenzie, with particular reference to the soundings, and we wish you to give your estimate derived from that source and from any other source, an idea of how far it is possible to reach the sealing and whaling grounds by way of Behring Straits. We want you to give now if you can the principal harbors on the sea coast of the region that we have under consideration? A. It will be easy to do that for the west coast of Hudson Bay. On the west coast of the whole bay from Chesterfield Inlet to Moose Factory there is only one harbor suitable for large vessels at all stages of the tide, namely Churchill Harbor.

Q. What is Chesterfield Inlet? It seems to be a deep indentation? A. Yes; it is an indentation of 230 miles in length and has narrows in it.

Q. Is it navigable for vessels? A. Yes.

Q. What is the name of the river running to the head of it? A. It is called the Doobaunt River on the maps.

Q. Do you know if salmon are found there? A. Yes; I understand that salmon are found—at least one species of salmon—in Chesterfield Inlet.

Q. Are there whales or seals near the mouth of the inlet? A. Yes, the great whaling grounds of Hudson Bay is opposite the mouth of Chesterfield Inlet, and in the neighborhood of Marble Island and Roe's Welcome.

Q. Is that point shown on the map? A. Yes. Continuing northward into Boothnia Bay these waters are now the great whaling grounds of the Americans.

Q. Do they go any further west than that? A. Farther north they do to Lancaster Sound and Prince Regent's Inlet and so on.

Q. Has the southern limit of permanently frozen soil been ascertained by you or by anyone else? A. No; I think it has not. This limit cannot well be defined without special experiments for the purpose. Great mistakes have been made by travellers in estimating the depths of frozen ground, because they see the cut-banks of rivers frozen and jump to conclusions, forgetting that the frost does not penetrate everywhere to that depth. The face of the bank is frozen, but it does not represent a perpendicular depth of frozen soil. Even Sir Henry Lafroy had been led into that error. I pointed out to him some years ago this fact, and he admitted that there was a great deal of force in it, that it did not indicate at all the depth of frozen ground throughout the country. At York Factory I have made experiments myself and proved this to be the case. There the bank face is 27 feet in height, and a short distance further up 30 to 40 feet, and it appears to be all frozen. Large flakes or frozen layers of earth peel off during the summer, and one might suppose there was 27 or 40 feet of frozen soil, whereas on going back a short distance into the country you find the ground is not frozen in the summer—that it is completely thawed out. We took a sharp pointed pole and drove it six feet into the soil in soft ground without finding any frost.

Q. Have the larger lakes and rivers an appreciable influence on the climate of the adjacent land? A. Yes; in that northern country they have a very marked influence, in regard to summer and autumn frosts at all events. The natural vegetation as well as the experience of cultivating the soil has proved this. The warm air that is wafted from the surface of the lakes and rivers on to the land for the distance of a mile or two has the effect of keeping off the summer and autumn frosts, and even larger rivers carry down warmer water and the air blowing over their surface has a good effect in preventing these frosts. It is along those rivers and around those lakes that the trees of more southern habit extend furthest north. They are enabled to mature their seeds along such rivers and lakes, whereas they cannot at some distance from them. The result is, the most northern examples we find of some species of trees are along rivers and lakes, and in regard to the cultivation of the ground it has been a great advantage to sow the seed near these waters.

Q. What are the principal economic minerals of the country we are investigating? We would like very much if you would give us that in *extenso*, in writing, and also the petroleum of the Athabasca country. I may say, in regard to that, that we have a communication from yourself concerning important analyses which were made of this by a celebrated man, in which you state the difficulty there was in giving us the benefit of this information, and upon that, at the request of the Committee, I wrote to the Deputy Minister of the Interior, asking him to get it for us,—that we were very anxious to have the fullest information about this, and to place you in such a position that you could give it to us; so that we will expect you to give us, in writing, the principal economic minerals of the country; and also, if the Department had taken any action in regard to that communication, that you should give us the analyses. A. Yes; I shall be very happy to do so.

Q. The Committee have found a great deal of difficulty in getting information regarding the quantity of furs exported from that region of country. We had hoped to obtain it by getting from the Department of Customs the exports of the region, but we ascertained in a letter from the Minister himself that they only kept records of the values—that he had no means of telling us the number of any kinds of furs exported. I then wrote to Montreal asking a large firm of fur dealers there to let me have, if they could get them for me, the Hudson's Bay Company's list for 1887 and 1886, and he also sent me a list of C. M. Lampson & Co. who also sell large numbers of British North American furs derived from free traders, and in some cases from the Hudson's Bay Company themselves. Here are the aggregates of these, and if

you have any knowledge of the proportion of these probably coming from the Mackenzie River district, we would like very much to know it :—

QUANTITY of furs offered for sale at London, England, at the annual auction sale by Hudson Bay Company, and C. M. Lampeon & Co. in the year 1887.

Otter.....	14,439
Sea Otter.....	3,868
Fisher.....	7,192
Fox, Silver.....	1,967
Fox, Cross.....	6,786
Fox, Red.....	85,022
Fox, White.....	10,257
Fox, Blue.....	1,440
Fox, Kitt.....	290
Lynx.....	14,520
Skunk.....	632,794
Marten.....	98,342
Mink.....	376,223
Beaver.....	104,279
Musquash.....	2,485,368
Extra black musquash.....	13,944
Wolf.....	7,156
Wolverine.....	1,581
Bear (all kinds).....	15,942
Musk ox.....	198
Badger.....	3,739
Ermine.....	4,116
Swan.....	57
Rabbit (American).....	114,824
Hair Seal (dry).....	13,478
Sable.....	3,517
Fox, Grey.....	31,597

A. No, I have no positive knowledge of the numbers that may come from the Mackenzie country. One might say in a general way which were the most likely to come from that region. Most of the fur-bearing animals are distributed over the whole northern part of the continent from Labrador to the Pacific Ocean. There are certain regions in which some are more abundant than others, and in that way you might suppose that a large proportion of the furs mentioned in this list came from the Mackenzie River country.

Q. From this list we eliminated the opossum, the grey squirrel and other animals leaving only the furs that we had learnt from other witnesses that that country produces. Now the important point is to get an approximation of the number of these furs that probably came from that district? A. It would be almost impossible, I am afraid, even to make an approximate estimate. The badger is one kind which would come altogether from the prairie country west of the Hudson Bay. The sea otter again would of course come from the Pacific. We have only one otter in all the rest of the country. The musk ox would come altogether from the country west of Hudson Bay, although the musk ox is found to the east of Hudson Bay, in the far north. But none of these skins are likely to have come from there. The muskrat would be principally from that region. The Lower Saskatchewan is the great muskrat country. The swan would be from the Hudson Bay country too. I fancy the red foxes of which a large number is stated, would come from that country also.

Q. Do you not think the same remark applies to the black and the Arctic fox? A. The Arctic fox is found in large numbers on the east side of Hudson Bay. The skunk, which is now a very fashionable fur, would be very largely found in the western country. They are very abundant both in the prairie and in the wooded

country of the North-West. A large portion of the beaver and prairie wolf also. The northern wolf is distinguished from the small wolf that we have here, so that the wolves would be mostly from the North-West Territories, and also a large proportion of the bears. The wolverines to a great extent would come from the North-West.

Q. Do you think we might assume as an approximate that three-quarters or two-thirds of these furs came from the Mackenzie Basin? Of course it can only be a matter of supposition? A. I should not like to say what proportion. Without having been in the trade it would be very difficult to know even approximately the proportion. They get from around Hudson Bay and Labrador a very large amount of fur, and also from the Pacific coast.

By Honorable Mr. McClellan:

Q. Does this map show the relative proportion of the arable and pastoral lands in the Dominion? A. Yes, east of the Rocky Mountains, irrespective of climate.

Bishop CLUT, recalled and examined.

By the Chairman:

Q. Have you heard of iron in the Mackenzie country? A. I was a missionary the whole time that I lived amongst the Indians. I am not a geologist and I cannot speak positively. I might make some mistake if I did so, and that was why I did not answer the printed question on this point. I think there are plenty of minerals all over that country, of every kind.

Q. I understand you are to visit the Geological Museum this afternoon: if you see any specimens that you think you have met with in the Mackenzie River district will you please tell Senator Girard and Professor Bell and they will tell us? A. I will do so.

Q. Will you show us on the map exactly where Fort Providence is—how far up the lake is it? A. It is about 40 miles down the Mackenzie River from Great Slave Lake.

The following letters were read:

COMMISSIONER'S OFFICE, HUDSON BAY CO.,
WINNIPEG, 19th April, 1888.

SIR,—I beg you to be kind enough to inform the Select Committee appointed by the Senate to report upon the resources of the Great Mackenzie Basin, that I shall have much pleasure in forwarding to the officers of the Hudson Bay Co. in charge of the forts named in your letter of 14th April, as well as to their Lordships Bishops Bompas and Farand, and to the Rev. Father Lecore at Fort Providence, the seeds and the circulars of Professor Saunders. The Company not having a post at Fort Yukon, as it is now in American territory, I am substituting Rampart House which is the nearest of the Company's posts and close to the 141st meridian. Fort Reliance has been long abandoned. I would suggest Fort Resolution in its place. As it would probably be safer, I am instructing the officers of the Company to send their reports to me, when received they will be forwarded to you. Probably the Bishops will send their replies direct. I shall be pleased if I can in any way be of service to the Committee.

I have the honor to be, sir, your obedient servant,

J. WRIGLEY,

Commissioner of the Hudson Bay Co.

The Clerk of the Committee on the Resources of the
Great Mackenzie Basin,
The Senate, Ottawa.

REGINA, N. W. T., 18th April, 1888.

SIR,—I have the honor to acknowledge receipt of your letter of the 10th inst., enclosing a series of questions relative to the resources of the Great Mackenzie River Basin, and requesting my answers thereto.

In reply, I beg to state that my knowledge of that part of our country being based upon only hearsay information of a very limited extent, I feel I must request you to express my regret to the Committee making the investigation for not answering their inquiries. Thanking you at the same time for the high compliment implied by your communication,

I have the honor to be, sir, your obedient servant,

A. E. FORGET.

The Honorable JOHN SCHULTZ, +
Chairman of the Senate Select Committee
on the Resources of the Great Mackenzie River Basin,
Ottawa.

METEOROLOGICAL SERVICE, TORONTO, 20th April, 1888.

SIR,—I have the honor to acknowledge the receipt of your letter of the 12th inst., requesting a short summary report giving the general bearing of climate, &c., &c., of the Mackenzie River region.

In reply, I beg to enclose tables giving such information as we have recorded in this office.

I have the honor to be, sir, your obedient servant,

CHARLES CARPMARL, *Director*.

Hon. Senator SCHULTZ, Ottawa, Ont.

METEOROLOGICAL OFFICE, TORONTO, 20th April, 1888.

Tables showing the average monthly and annual temperature, the highest and lowest temperature recorded in each month, the average amount of rain and snow fall in each month, and the number of days on which such fall occurred.

Fort Chippewyan, from observations made during the years 1883 to 1887, with a list of seasonal and periodic events.

Fort Dunvegan, from observations made during 1880-84.

Fort Rae, from observations made 1st September, 1882, to 31st August, 1888. International polar expedition, with remarks extracted from report of officer in charge.

Lesser Slave Lake, from observations in 1884-85.

Moose Factory, from observations in 1877-82.

Fort Simpson, Mackenzie River, from observations by Chief Trader Onions, H. B. Co., May to November, 1875.

Fort Rae, from observations made by Mr. Flett, H. B. Co., during the year 1875. The observations at *Winnipeg* and *Ottawa* are added for comparison.

TABLE I.—AVERAGE Monthly and Annual Temperatures.

Stations.	Lat. N.	Long. W.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	°	'	°	°	°	°	°	°	°	°	°	°	°	°	°
Fort Chippewyan	58 43	111 19	-20.2	-13.9	2.5	26.4	43.2	58.7	61.8	56.4	43.9	30.1	15.1	-0.5	25.4
Fort Dunvegan	55 56	119 2	-11.9	2.6	20.3	35.1	50.1	55.9	60.5	57.4	45.7	31.6	16.5	-4.9	29.9
Fort Rae	62 39	115 44	-19.1	1.2	-7.8	19.2	27.7	51.4	61.2	56.5	44.4	38.8	9.3	-15.2	21.3
Lesser Slave Lake	55 20	115 30	-10.5	8.5	22.3	37.0	49.3	57.5	58.6	56.8	45.5	32.0	24.1	.....	.....
Moose Factory	51 16	80 56	-3.4	1.8	11.8	25.2	43.9	52.4	62.5	59.2	51.0	39.1	21.3	9.9	31.2
Winnipeg	49 55	97 7	-7.4	0.0	12.0	34.7	52.0	61.9	66.0	63.6	51.5	38.5	17.8	2.3	32.7
Ottawa	45 26	75 41	10.3	11.7	20.0	38.4	55.4	63.9	69.4	62.4	58.2	45.3	29.6	14.5	40.1

TABLE II.—Maximum and Minimum Temperatures in each Month; where possible, the Highest and Lowest of each in the period is given.

HIGHEST AND LOWEST MAXIMUM.

	January.	February.	March.	April.	May.	June.	July.	August.	Sept'r	October.	November.	December.
	°	°	°	°	°	°	°	°	°	°	°	°
Fort Chippewyan.....	45	43	47	54	66	86	83	87	79	66	45	39
Fort Dunvegan.....	49	45	55	73	79	87	87	90	76	74	58	46
Fort Rae.....	4	26	17	45	65	76	77	78	69	55	35	24
Lesser Slave Lake.....	30	43	48	57	72	81	81	83	70	59	49	.....
Moose Factory.....	41	45	49	57	74	92	92	85	77	81	63	41
Winnipeg.....	40	44	64	77	95	95	95	98	81	86	64	38
Ottawa.....	53	51	55	80	92	98	98	99	83	80	65	43

HIGHEST AND LOWEST MINIMUM.

Fort Chippewyan....	-40	-44	-41	-31	1	6	24	27	33	26	43	25	33	26	29	-9	10	-3	8	-41	-20
Fort Dunvegan.....	-62	-55	-52	10	-27	17	20	23	30	32	34	35	31	33	22	25	-4	20	-26	12	-30
Fort Rae.....	-8	-40	-40	.....	-11	.....	0	.....	28	.....	48	.....	38	.....	39	.....	10	.....	-32	.....	-40
Lesser Slave Lake....	-45	-35	-10	.....	22	.....	33	.....	39	.....	38	.....	42	.....	27	.....	20	.....	2	.....	.....
Moose Factory.....	-40	-41	-35	-14	-18	8	13	22	27	33	36	42	35	38	28	35	8	17	-29	8	-45
Winnipeg.....	-48	-44	-3	-38	-14	24	18	30	38	44	37	50	30	46	19	37	3	22	-34	10	-54
Ottawa.....	-33	-31	-32	-2	0	23	24	35	35	46	42	52	34	50	20	41	17	29	-23	19	-31

TABLE III.—MONTHLY Fall of Rain and Snow, with the Number of Days.

STATIONS.	January.		February.		March.		April.		May.		June.		July.		August.		Sept.		October.		November.		December.	
	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.	Amount.	Days.
	in.		in.		in.		in.		in.		in.		in.		in.		in.		in.		in.		in.	
Fort Chipewyan	0	0	R	1	R	1	0-01	2	0-49	7	1-20	8	1-97	10	0-74	10	1-51	12	0-30	4	R	1	0-0	0
Fort Duvergan	0	0	0	0	0-30	2	0-57	3	2-24	6	3-07	12	1-36	7	2-9	9	1-34	8	0-95	4	0-48	2	0-12	1
Fort Rae	0-19	5	0-75	13	0-04	3	0-15	2	0-24	8	0-55	9	0-74	7	1-20	14	0-43	11	1-92	15	1-10	15	0-57	13
Lesser Slave Lake	0	0	0-02	2	0-17	3	0-61	6	2-18	10	0-61	4	1-46	9	0-81	10	2-04	12	0-39	6	0-08	4	.....	.....
10 Moose Factory	0-09	1	0-06	1	0-19	2	0-36	5	1-81	11	3-13	14	3-22	15	3-84	13	4-27	18	1-79	11	0-52	3	0-16	1
Winnipeg	R	R	0-04	1	0-32	1	0-82	4	2-24	10	3-67	11	2-60	11	2-97	11	1-76	9	1-39	6	0-08	1	0-08	1
Ottawa	0-51	3	0-58	2	0-84	4	1-13	7	2-62	12	2-10	9	2-12	10	1-95	9	2-94	14	2-60	14	1-35	9	0-70	2
S N O W F A L L.																								
Fort Chipewyan	6-9	8	6-4	9	9-8	12	4-9	6	0-5	2	.....	.....	.....	.....	.....	.....	1-6	3	7-9	8	7-3	9	8-9	9
Fort Duvergan	17-1	7	12-9	7	19-8	7	1-9	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5-2	3	7-5	5	10-2	7
*Fort Rae .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lesser Slave Lake	18-5	12	11-2	11	14-5	6	12-0	5	12-0	3	.....	.....	.....	.....	.....	.....	.....	.....	6-8	6	3-4	7	.....	.....
Moose Factory	14-2	12	6-5	9	12-9	14	6-5	7	3-7	5	.....	.....	.....	.....	.....	.....	.....	.....	3-6	6	16-7	14	13-2	16
Winnipeg	6-2	9	10-4	8	5-1	5	4-2	4	0-8	0	3	.....	.....	.....	.....	.....	0-8	1	4-5	5	9-2	10	12-0	9
Ottawa	22-4	14	19-0	10	16-7	11	6-9	4	0-2	1	.....	.....	.....	.....	.....	.....	.....	.....	1-6	2	10-3	8	27-0	14

*Included in rainfall.

TABLE IV.—ABSTRACT of Meteorological Observations at Fort Simpson, Mackenzie River, Lat. N. 61° 52', Long. W. 121° 25', by Mr. ONIONS, Chief Trader, Hudson Bay Company—May to November, 1875.

Month.	Temperature.			Extreme of Temperature.	Number of Winds from								Velocity of Wind in Miles.			Greatest Velocity in Miles, and Direction.		Amount of Sky Clouded.	Number of Days Rain.	Number of Days Snow.	Number of Auroras.	Thunder Storms.			
	Temperature.				Number of Winds from								Velocity of Wind in Miles.			Greatest Velocity in Miles, and Direction.									
	7 A.M.	2 P.M.	9 P.M.		Mean.	Max.	Min.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	O.	7 A.M.						2 P.M.	9 P.M.	Veloc.	Direc.
January.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
February	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
March	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
April	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
May	41.6	51.3	43.7	44.6	70	11	19	10	17	10	3	3	0	20	8	5	7	5	24	N.W.	58	11	3	2	
June	54.8	65.8	57.4	58.8	81	33	30	6	29	11	2	0	1	4	7	7	7	6	45	W.	49	11	...	0	6
July	59.8	72.0	61.0	63.5	90	42	16	10	22	13	3	0	2	19	8	7	6	4	16	N.E.	42	10	.....	0	2
August	59.9	70.8	61.1	63.2	83	50	6	4	33	20	12	0	0	11	7	6	6	4	22	E.	33	7	.....	2	4
September	43.2	54.9	44.8	46.9	74	27	23	5	22	5	2	3	1	19	1	7	7	5	18	N.	53	7	2	6	.....
October	26.7	30.7	28.3	28.5	51	12	6	6	21	12	2	3	13	29	1	8	8	8	16	N.	90	6	23	2	.....
November	15.3	7.9	13.5	12.5	19	15	3	0	3	13	3	1	21	31	9	8	8	7	21	N.W.	49	.....	11	9	.....
December	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE V.—ABSTRACT of Meteorological Observations at Fort Rae, Lat. N. 62° 39', Long. W. 115° 44', by Mr. A. FLETT, Hudson Bay Company, during the Year 1875.

Month.	Temperature.			Extremes of Temperature			Mean Amount of Clouds.	Number of Winds.							Estimated force of Wind.			Rain.		Snow.		No. of Auroras.		
								N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	O.	7 A.M.	2 P.M.	9 P.M.	Amount.	Days.			
	7 A.M.	2 P.M.	9 P.M.	Mean.	Max.	Min.																		
	°	°	°	°	°	°	0-10										0-10	0-10	0-10	in.	in.	Amount.	Days.	
January.....	-21.3	-18.0	-31.6	-20.6	0.0	-44.0	41	36	0	6	10	10	0	3	26	2	1.6	1.7	1.6	0	0	0.5	4	.....
February	-30.3	-21.9	-24.7	-25.4	12.0	-53.0	32	54	0	1	15	8	0	0	3	3	1.5	1.6	1.1	0	0	1.6	5	12
March	-23.6	-10.3	-19.0	-18.0	10.0	-48.0	32	47	3	16	20	2	0	4	0	1	1.7	1.8	1.2	0	0	0.8	3	12
1st April.....	0.9	-12.3	0.5	3.8	35.0	18.0	36	26	6	0	39	6	1	1	9	2	1.9	2.2	1.6	0	0	2.7	7	11
5th April.....	35.6	41.3	35.9	37.2	55.0	18.0	49	20	2	32	21	1	2	9	4	2	1.5	1.6	1.4	R	1	0.5	4	1
June.....	51.0	58.6	52.1	53.4	75.0	35.0	42	0	5	31	17	1	1	3	29	3	1.8	1.8	1.7	1.50	4	.....	...	0
July.....	64.2	70.5	62.1	64.7	79.0	52.0	32	7	2	22	21	3	7	9	14	2	2.3	2.5	2.0	1.63	2	...	...	0
August (1st to 15th.)	68.9	73.1	66.1	68.6	85.0	60.0	24	1	0	30	16	2	1	2	4	1	2.5	2.7	2.5	R	1	.....	...	...
September.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
October	21.6	25.8	22.5	23.1	35.0	6.0	83	38	4	33	9	1	3	1	2	2	1.6	1.9	2.0	1.00	1	3.5	5	0
November.....	-15.6	-13.2	-15.0	-14.7	16.0	-49.0	48	75	2	3	2	3	0	1	4	0	2.3	2.5	2.0	0	0	3.6	8	9
December.....	-30.8	-29.0	-31.2	-30.8	-8.0	-55.0	45	45	3	4	17	4	1	1	16	2	2.7	2.9	2.1	0	0	6.0	10	15

FORT CHIPPEWYAN.

Seasonal and Periodic Events.

1883.

- Oct. 8. Pheasant passing.
- 10. Small birds passing south.
- 11. First ptarmigan seen about fort.
- 12. Snow birds have made their appearance.

1884.

- April 2. Snow birds seen last week at Fort Smith.
- 9. Grey geese seen.
- 16. Barking crows heard.
- 22. Catkins beginning to bud.
- 25. Water from Athabasca River coming on to lake.

- May 2. Blackbirds.
- 8. Butterfly, frogs, robins.
- 10. Purple crocuses.
- 19. Sand martens.
- 20. Swans passing.
- 31. Trees bursting into leaf.

- Oct. 14. Snow birds.
- 18. Ptarmigan.

1885.

- March 22. Snow birds.

- April 11. Catkins beginning to bud.
- 12. Water coming over ice from river.
- 13. First goose seen.
- 21. Barking crows.
- 27. Blackbirds, mosquitoes.
- 29. White cranes.
- 30. Frogs.

- May 1. Dark butterflies, three purple crocuses, gulls.
- 4. Frogs noisy, white waives.
- 5. Plover.
- 6. Nearly clear of ice.
- 9. Water from Peace River flowing into lake.
- 13. Sand martens.
- 24. Wavies passing north.

- Oct. 1. Snow birds.

1886.

- March 29. Snow birds.

- April 11. Geese and ducks to south and south-west.
- 12. Barking crows.
- 18. Water coming on to lake from Athabasca River.
- 18. Geese seen at fort.
- 20. Blackbirds.
- 21. Summer birds, plover.
- 23. Gulls, cranes, white wavies, robins.
- 24. Some catkins are out.

- May 8. Frogs, butterfly, eagle.

- 15. Frogs noisy, bumble bees.

- June 2. Willows bursting into leaf.

- July 12. Strawberries.

- 14. Eye berries.

- 15. Raspberries.

- Aug. 17. Cranes passing south.

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- | | | |
|-------|--|-------|
| Oct. | 9. Snowbirds. | |
| | 14. Flocks of geese passing south. | |
| Nov. | 13. Ice in lake broken up. | 1887. |
| March | 18. House flies. | |
| | 25. Barking crows. | |
| April | 5. Snow birds. | |
| | 11. Geese to south-west. | |
| | 12. Hawk. | |
| | 16. Small summer birds, geese passing. | |
| | 21. Butterfly. | |
| | 22. Water on Embarras River coming into lake. | |
| | 23. Willows budding. | |
| | 26. Robins. | |
| | 28. White waxies. | |
| | 30. Most of snow gone. | |
| May | 2. Frogs, mosquitoes. | |
| | 4. Purple crocuses, swans, frogs noisy. | |
| | 10. Ice drifting in channel in front of fort. | |
| | 14. Ice drifting in from Peace River. | |
| | 15. A little snow in sheltered places. | |
| June | 3. Snowed during day. | |
| Oct. | 23. Lake in front, closed up this morning. | |
| | 27. Fishing under ice begins. | |
| | 28. Ptarmigan. | |
| | 30. Ice in channel is broken up. | |
| Nov. | 7. Ice at fisheries broken up and drifted off. | |
| | 11. Ice still drifting. | |
| | 15. Channel closed up during night. | |
| | 26. Snow birds here yet. | |
| Dec. | 18. Snow birds here yet. | |
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FORT RAE.

Extract from Captain H. P. Dawson's introduction to the published observations.

"The first snow fell on the 27th September, but it was not until a month later that the lake froze. The residents all agreed that the season was a very exceptional one, the winter being unusually mild and late in setting in. At the end of November the Mackenzie River was still barely free from ice, whereas it is usually full of drifting ice in October and frozen over in November. There was also much less snow than usual. A party of Indians who came in on the 16th January, reported that the country 50 miles to the N.N.W. was quite bare of snow, the ground being not even white. The winter was also unusually free from storms, which from all accounts, and from the journal kept at the station, seem to be both frequent and severe in ordinary years.

"The snow began to disappear about the middle of April, and on the 3rd of June the ice began to break up.

"By the 16th it had entirely disappeared from the neighborhood of Fort Rae, though it was visible for some time longer in the direction of the main lake.

"The trees first showed signs of budding on the 16th May, and on the 1st of June they were in full leaf. When the party left the place on the 1st of September they were already yellow and beginning to lose their leaves."

MOOSE FACTORY.

1877.

- Oct. 21. First snow.
 26. River frozen on sides.
 Nov. 7. North division of river fast frozen.
 Dec. 9. South division of river fast frozen.

1878.

- Feb. 5. Snow in woods 10 inches deep.
 March 9. First rain of year.
 15. Snow birds.
 April 5. First goose and robin.
 15. Blackberries.
 30. Frogs.
 May 1. Mosquitoes; swallows seen.
 18. Garden vegetables sown.
 21. Potatoes planted.
 June 28. Thunder storms.
 July 20. Thunder storms.
 Sept. 7. Thunder storms.
 Oct. 16. First snow.
 Nov. 2. River frozen over.
 5. Snow in the woods 5 inches deep.
 25. Twelve inches of snow in woods.
 Dec. 16. Two inches of snow in woods.
 25. Thirty inches of snow.

1879.

- March 10. First rain.
 May 4. Sufficient snow in woods for sleighing.
 Sept. 13. First snow.

1880.

- April 4. First rain.
 14. Thunder and lightning.
 Oct. 19. First snow.

1881.

- March 17. First rain.
 May 8. Frogs heard.
 9. River open.
 Nov. 14. River frozen over.

CHARLES CARPMAN, *Director*.

METEOROLOGICAL SERVICE OF CANADA, TORONTO, 25th April, 1888.

The Honorable Senator SCHULTZ,
 Ottawa, Ont.

DEAR SIR,—I enclose herewith a table of occasional and seasonable events for Winnipeg or vicinity from 1871 to 1887. I forward this table for comparison with the meteorological data which I sent to you on the 20th instant, and which I hope will prove interesting.

I remain, dear sir, yours truly,

CHARLES CARPMAN, *Director*.

OCCASIONAL or Seasonable Events at

	First Rain in Spring.	Wild Geese seen.	Wild Ducks seen.	Robins seen.	Butterflies seen.	Mosquitoes seen.	Frogs heard.	Red River clear of ice.
1871.	.....	.....	April 7...	April 10...	April 15...	May 14...	April 15...	.....
1872.	April 28...	April 30...	do 7...	do 24...	do 12...	do 24...	May 12...	May 4...
1873.	do 1...	do 9...	do 13...	do 12...	do 3...	do 10...	April 27...	April 27...
1874.	March 16...	March 28...	do 5...	do 7...	do 1...	do 3...	do 25...	do 30...
1875.	April 21...	April 8...	do 12...	do 6...	March 26...	do 5...	do 24...	do 30...
1876.	Jan. 16...	do 9...	do 14...	do 10...	do 31...	April 26...	do 21...	do 24...
1877.	Feb. 21...	do 1...	do 9...	do 10...	April 18...	do 18...	do 16...	do 22...
1878.	do 5...	do 2...	March 12...	March 15...	March 6...	do 12...	March 25...	March 20...
1879.	March 27...	March 26...	do 28...	April 9...	do 30...	do 16...	April 9...	April 11...
1880.	do 26...	do 25...	do 22...	do 4...	do 23...	do 14...	do 23...	do 25...
1881.	do 23...	do 23...	do 25...	do 5...	do 24...	do 12...	do 21...	do 24...
1882.	April 24...	do 27...	do 31...	do 17...	April 5...	do 15...	do 17...	do 19...
1883.	March 12...	April 24...	April 12...	do 22...	do 10...	do 14...	do 26...	do 21...
1884.	April 13...	do 7...	do 12...	do 22...	do 8...	May 2...	do 22...	do 23...
1885.	do 3...	do 8...	do 2...	do 17...	.....	.....	do 24...	do 20...
1886.	March 24...	do 8...	do 10...	do 12...	.....	.....	do 12...	do 15...
1887.	Feb. 14...	do 7...	do 12...	do 7...	.....	.....	do 15...	do 28...

For comparison with similar event at Fort Chippewyan or Fort Rae.

Winnipeg, or vicinity, 1871 to 1887.

First Lightning.	First Thunder-storm.	Last Frost.	First Steam-boat.	Last Snow.	First Frost.	First Snow.	Red River Frozen.	—
.....	.....	June 15...	.....	.....	.....	Oct. 15...	Nov. 12...	1871
April 29...	April 29...	May 11...	.....	April 30...	Sept. 21...	Sept. 24...	do 13...	1872
do 5...	do 5...	do 29...	April 30...	do 14...	do 5...	Oct. 22...	Oct. 28...	1873
do 9...	do 9...	June 9...	.....	do 26...	do 14...	do 29...	Nov. 12...	1874
May 22...	do 22...	do 12...	April 30...	June 2...	Aug. 22...	do 2...	do 4...	1875
Jan. 16...	Jan. 16...	do 17...	do 25...	May 2...	Sept. 26...	do 2...	do 13...	1876
April 21...	April 22...	do 13...	do 23...	April 6...	do 5...	do 28...	do 6...	1877
June 22...	June 22...	May 21...	March 22...	May 3...	do 11...	Sept. 20...	Oct. 30 } *Nov. 27 }	1878
May 21...	May 21...	June 1...	April 12...	April 26...	do 13...	Nov. 5...	Nov. 1...	1879
do 3...	do 6...	do 1...	.....	do 28...	do 7...	Oct. 15...	do 12...	1880
do 20...	do 20...	May 20...	.....	do 9...	do 6...	do 12...	do 14...	1881
do 24...	June 15...	June 9...	.....	May 20...	do 19...	do 30...	do 18...	1882
do 17...	May 17...	do 9...	April 27...	do 9...	do 7...	do 10...	do 11...	1883
do 4...	do 4...	do 9...	.....	do 1...	Aug. 22...	do 21...	.....	1884
April 9...	April 9...	do 8...	.....	do 8...	do 24...	do 18...	Nov. 10...	1885
do 14...	do 21...	do 7...	.....	April 29...	do 31...	do 29...	do 10...	1886
do 29...	May 1...	May 26...	.....	May 2...	Sept. 15...	do 9...	do 24...	1887

* River broke up in November.

Answers from Rev. J. GOUGH BRICK, Peace River, N.W.T., Present address
317 Carlton St., Toronto.

I have only travelled over a part of the section of the country to which your questions apply, viz:—From Winnipeg down the Red River, across Lake Winnipeg to Grand Rapids, up the Saskatchewan River to Fort Carlton, overland to Green Lake, down the Beaver River to Isle à la Crosse, up the ——— River to the Long Portage over the height of land, down the Clearwater to Fort McMurray, down the Athabasca River to Fort Chippewyan and up the Peace to some distance above Fort Dunvegan.

7. The Athabasca is navigable from the rapids above Clearwater to Fort Chippewyan. The Clearwater would not be of any service for steamers. There are at least five or six rapids that no steamer would pass.

10. The Peace would be navigable for the ordinary North-West flat-bottomed steamer from Hudson's Hope on the easterly side of the Rockies to Fort Chippewyan, with the exception of the "Falls," some 50 miles below Vermillion.

21. The usual snowfall in Peace River is from 18 inches to three feet.

27. Cannot say.

28. Do not think corn has ever come to maturity in the far North-West. The heights are too cold. I have tried corn and it has just formed in the cob.

29. I have ploughed on the 8th of April, and sown wheat on the 12th of April, and that wheat was cut about the 20th August at Dunvegan, Peace River.

32. Wheat, sown from 12th April to 1st May; harvested end of August.

Barley, do 10th to 20th May; harvested end of August.

Rye, none.

Oats, same as wheat.

Potatoes planted about 16th May; dug in September.

Turnips do do ; gathered 10th October.

Indian corn, none.

Strawberries do

Gooseberries do

33. Very dry until about the middle of July; then some seasons we get considerable rain.

34. Some seasons; still not as destructive in the Peace River country as further south.

35. Local.

36. I think so.

37. The early part of the summer is generally dry.

38. Very pleasant indeed.

40. The ordinary prairie grasses, with wild vetches and pea-vine in abundance.

41. More or less all over the country.

43. Black loam.

44. A large percentage is fit for grain, the rest for pasturage.

45. The finest climate in the world.

46. We have none in the Upper Peace River.

47. I have not kept any record.

48. It is difficult to say. Ice begins to run in the Peace about the 5th of November, but some seasons remains open until 20th December. Generally breaks up at 10th to 15th April.

49. South-west.

50. They prevail in the Upper Peace River country.

51. The Hudson Bay Company have done a little farming, in connection with other posts, at Dunvegan, St. John's, Hudson's Hope and Vermillion for very many years; I suppose that at Dunvegan they have raised wheat, barley and potatoes for 75 to 100 years, and seldom have the crops turned out a total failure. In 1884 I went up on to the height of the prairie country, some thirty-six miles in Dunvegan, and broke up about three acres for an experiment; 1885, crop on land once ploughed

fairly good; 1886, magnificent crop of wheat, barley, peas, potatoes, turnips and all other vegetables; 1887, sorry to say, a total failure; a frost on the 26th July killed out everything.

53. Caribou, none; musk ox, none; wood buffalo, none; moose, a few; elk, none.

57. Very few fish in Peace River; good whitefish in Lesser Slave Lake.

62. Large wooded country. Spruce, juniper, poplar and white birch. We have good spruce; can take out logs 70 feet long butt. Build a railway into the country.

64. No.

65. Cannot say; we have a little in swamps.

66. Would a great deal rather have the Hudson Bay Company's fine congou.

68. Plenty of the best limestone at Hudson's Hope.

76. Strawberries, raspberries; the service berry grows on the Peace in great abundance,—the best wild fruit that grows.

82. In the Upper Peace River we have Beaver and Wood Cree Indians scattered all over the country; decrease; the principal "sickness" is want of food; measles carried away some 200 in the fall of 1886.

83. The staple article of food is rabbits, when there are any, moose, bear, lynx, beaver, geese and ducks. In Peace River the Indians are raising considerable potatoes; a few are raising a little barley and wheat.

85. We have an abundance of rabbits for three years, then we are three years without any. There must be some disease which kills them off; then when they get so abundant, they kill off all the small brush or shrubs in the country, and they certainly migrate, going to the south-west, and when they return they come from the north.

86. One.

89. I am afraid it would not improve them any.

90. I think it would be mutually advantageous.

The accounts I have recently received from the country represent the Indian in a shocking state of suffering from actual starvation. This is the second year of no rabbits, and there will be none next year. I do think that if the Government are not prepared to make treaties with them, some help in the way of sending in supplies should be rendered.

Answers from GEORGE M. DAWSON, M. D., LL. D., Assistant Director Geological Survey of Canada.

Series A.—Relating to Navigation and Communication.

1. The portions of the Mackenzie Basin with which I have personal acquaintance are:—Athabasca River from "Landing" north of Edmonton to Baptiste River, Peace River Valley from Smoky River to headwaters west of Rocky Mountains, country between above designated portions of rivers, upper waters of Peace and Liard Rivers west of Rocky Mountains.

2. This information is given under heads of separate rivers below.

Stern-wheel steamers are those best suited for the navigation of all the north-western rivers, which differ altogether in character from such streams as the St. Lawrence and Ottawa, being in general swifter and consequently much more shoal relatively to the volume of water carried.

Three natural main routes of communication exist by which the continuously navigable waters of the Mackenzie may eventually be reached. 1. North-westward from Saskatchewan Region. 2. Eastward from Port Simpson and the Peace River Valley. 3. Eastward from some Pacific port via Liard River valley. The routes most favorable for railway construction are shown in blue lines on the accompanying map.

The following are rough approximations to distances by various routes:—

	Miles.
Edmonton to Fort Smith <i>via</i> Peace River	600
do do Athabasca River..... ..	500
Prince Albert to Fort Smith <i>via</i> Athabasca River.....	600
Pacific <i>via</i> Skeena and Peace Rivers to Fort Smith...	930
do Stikeen and Liard to Fort Simpson.....	650

5. Information collected by Capt. McClure, of the "Investigator," sent out in search of Sir J. Franklin in 1850, *via* Behring Strait, led him to expect that in mid-summer open water was to be found between the North American coast and the main ice pack as far east as long. 130 deg., or to the east of the Mackenzie mouth. He found, however, considerable difficulty in working his way eastward, the lane of open or "land water" being often from a few yards only to a mile in width. This lane is formed by the grounding of the heavy pack at some distance from shore. McClure describes the coast generally as low and dangerous and devoid of any shelter or havens. Ekimio reports received by him stated that the "land water" was never more than three to five miles wide to the east of Point Barrow, the sea to the north being always occupied by solid pack.

On page 207 of Osborne's narrative of McClure's voyage, the character of the pack in this part of the Polar Sea is thus described:—

"The pack was of the same fearful description as that encountered in the offing of the Mackenzie River. The surface of the floes resembled rolling hills, some of them 100 feet from base to summit, and the edges of this wonderful oceanic ice rose in places from the water as high as the 'Investigator's' lower yards."

This ice appears to be the same with that met with by Nares's expedition to the north of Grinnell Land and Greenland, and which they there named "polarocrystic ice."

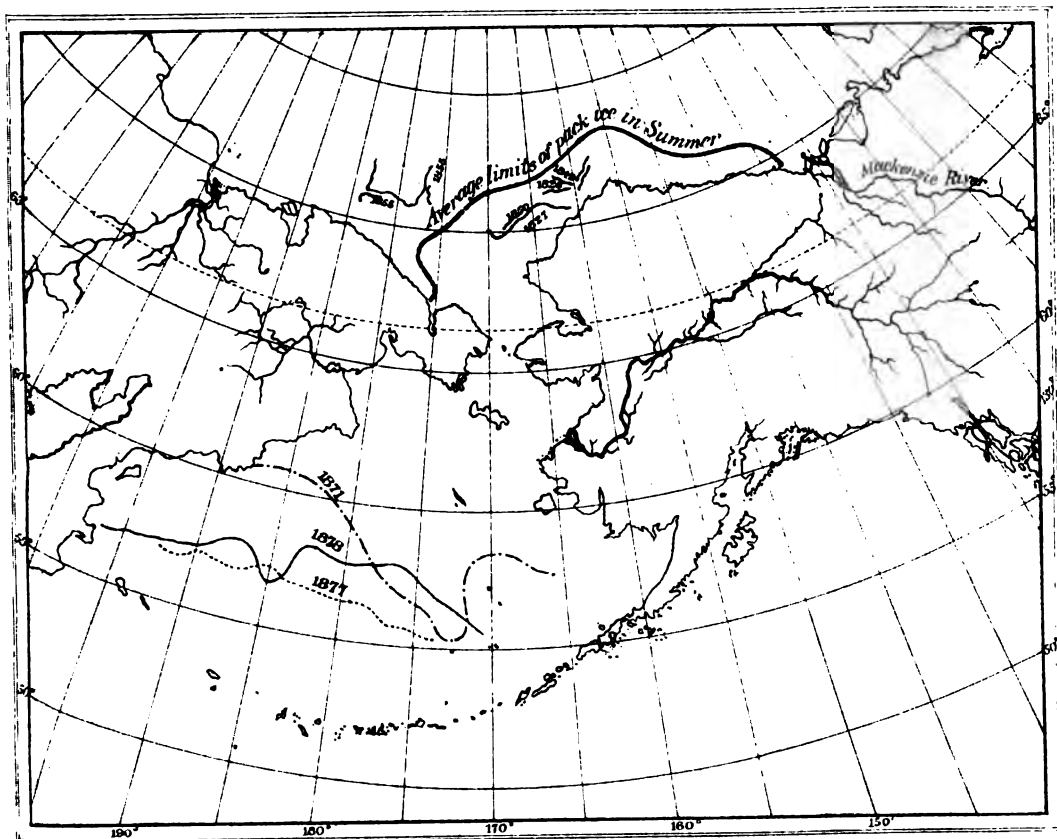
In 1826 Sir J. Franklin, leaving the Mackenzie in boats, managed, by following the shore, to get as far westward as Return Reef, about 350 miles from the Mackenzie, where he was stopped by ice. Messrs. Dease and Simpson, in 1837, got some distance further along the coast in the same way, but were also stopped by ice grounded on the shores before reaching Point Barrow.

Sir J. Richardson ascertained that the water issuing from the Mackenzie had some influence in opening the ice about its mouth. McClure found the temperature of the surface water to rise from 28 deg. Fahrenheit to 39 deg. when abreast of the Mackenzie, and both he and Capt. Collinson of the "Enterprise" speak of the effect of the Mackenzie in widening the "shore water" which McClure in 1850 (August) found to be 50 miles wide off the estuary. He spent the winter of 1852-53 in Cambridge Bay, Dolphin and Union Strait, from which he was unable to escape until the 24th of August, 1853. In working his way westward in that year, however, he was much impeded by ice-pack where he had found the open water before off the Mackenzie, and only succeeded in getting as far west as 145° 30' (Camden Bay) when he was again frozen in on the 12th of September.

Our knowledge of the ice to the north and east of Behring Strait has since been much increased by the experience of the whalers, and the general result is shown on the attached tracing of a map from the U. S. Coast Pilot of 1879.

Capt. Hooper, U. S. R. M., writes of the ice in this region as follows:—"In that part of the Arctic visited by the "Corwin" the ice is quite different from that in the vicinity of Greenland. No immense icebergs raise their frozen peaks hundreds of feet in the air. The highest ice seen by us during the season would not exceed fifty feet in height. The average height of the main pack is from ten to fifteen feet, with hummocks that rise to twenty or thirty feet. * * * The general breaking up of the ice in this region commences in May or June in the vicinity of Behring Strait, and continues until the first part of September, after which time new ice begins to form, although the sea is not entirely closed for some weeks later."—Cruise of U. S. Revenue Steamer "Corwin," 1881.

MAP
Showing limits of pack-ice in the Arctic Ocean and Behring Sea,
 based on maps in U. S. Pacific Coast Pilot, Alaska, Appendix I. 1879.
 Report on the Cruise of U. S. Revenue Steamer Corwin, 1881.
 U. S. Coast and Geodetic Survey, 1882.



— Observed positions of southern edge of
 pack ice in July and August, in certain years

— } Observed positions of southern limit
 of ice in April and May, in certain years

— Average limit of pack ice in Summer

After reading the narratives of McClure, Collinson, Franklin, Dease and Simpson, McGuire (of the store ship "Plover") and others, it would appear that it is not difficult in almost any season to get as far as Point Barrow and to return to Behring Straits, even with sailing vessels. Thence to the mouth of the Mackenzie, a distance of over 500 miles, the navigation is much more difficult and precarious. It would seem probable, however, that a properly equipped steamer might almost every season reach the mouth of the Mackenzie, and, wintering there, return the following season. It might at least be well worth while to make this experiment.

Respecting the estuary of the Mackenzie and the navigability or otherwise of the channels of its delta very little appears to be known. It is probable that deep navigable channels might be found on examination, though at the same time quite possible that it might prove to be (like the Yukon mouth on Behring Sea) impossible of approach by sea-going vessels on account of shallow water.

I have conversed with several persons who have been engaged in whaling to the north of Behring Strait, and have been informed that of late years some of the whalers have penetrated nearly to the mouth of the Mackenzie.

The whaling fleet is almost entirely composed of vessels sailing from San Francisco, and is much reduced in number as compared with former years. Steamers were first employed in this fishery about 1880 and about one-quarter of the fleet is now steam. In the early part of May and in June they find a few whales migrating northward on the Siberian coast, being the last of the "herd." During the middle of summer the whales are far to the north and few are seen. The vessels occupy themselves in taking walrus. In the latter part of August and during September the whales are found in great numbers migrating southward and south-westward toward Behring Strait. In 1886, according to A. H. Clark, 44 vessels were employed. They obtained 20,307 barrels of oil, 332,931 pounds of whalebone, and 5,273 pounds of walrus ivory.

It is probable that whaling stations like those of Cumberland Inlet and Hudson Bay might advantageously be established near the mouth of the Mackenzie, the catch being removed by steamers as before indicated.

The season of navigation along the coast in this region may be expected to be about two months from, say, July first to September 10th.

The above is but an imperfect outline of the matter in discussion. For additional details the following among other works should be consulted:—

1. Narrative of a journey to the shores of the Polar Sea, 1819-22, Capt. J. Franklin.
2. Narrative of a second expedition to the shores of the Polar Sea, 1825-27, Capt. J. Franklin.
3. Narrative of discoveries on the north coast of America, 1836-39, T. Simpson (also papers in Royal Geog. vol.).
4. Arctic search expedition, Sir T. Richardson.
5. Papers, and 'further papers' relating to Arctic expedition in search of Sir J. Franklin.
6. Discovery of the North-West Passage, McClure.
7. Personal narrative of the discovery of the North-West Passage by A. Armstrong, M.D.
8. Report of the expedition to Point Barrow by Lieut. Ray.

6th Question:—The Athabasca was formerly used as a trade route and navigated by boats from its mouth to the Rocky Mountains. Of the portion above the landing I believe 170 miles to the mouth of the McLeod River might be navigated by stern-wheel steamers. The slope averages about four feet to the mile in this part and there are several little rapids, but none serious. I have no personal knowledge of the lower part of the Athabasca.

The Lesser Slave River is about 41 miles in length. It is obstructed by shallow stony rapids for 18 miles up from its mouth (rapids about 20 in number. Total fall nearly 100 feet). This part of the river is navigable for boats, but doubtful for steamers even if small. The upper part of the river might be navigated by a

small steamer (it flows at the rate of about one-seventh mile per hour) and with Lesser Slave Lake would afford a length of about 90 miles of steamer navigation. (For particulars see Report of Progress, Geol. Survey, 1879-80, p. 82 B. and map.) The west end of the lake is connected by a cart road about 55 miles in length with the Peace River, at its confluence with the Smoky River.

The Pembina is said to be navigable for large boats for about 60 miles from its mouth, but I have no personal knowledge of the navigability of this or the McLeod River.

Mr. R. G. McConnell (my assistant in 1879) found it impossible to ascend the La Biche River, even with a small bark canoe, in the autumn. La Biche Lake is connected with the Athabasca by a cart road, about 25 miles in length. (See extract from Mr. W. Ogilvie's report.)

Additional information in reply to Questions 6 and 7, extracted from report by W. Ogilvie, D. L. S.:—

Athabasca River, below "The Landing."

Descending the river from the landing, only two rapids worth mentioning are met with between that point and Grand Rapids. The first of these is situated 120 miles below the landing, and is caused by a bar of gravel reaching across the river, which in this part is somewhat wider than the average, and correspondingly shallow. This rapid presents no obstacle to the passage of York boats not drawing more than 2 feet of water, nor do I think it would, with the water at its ordinary height, to steamboats such as navigate the Saskatchewan; and even should such be the case, it would be no very difficult matter to construct a channel, as the bar is not more than 100 to 120 yards in length.

The second rapid is met with 143 miles from the Landing, and though rougher than the first, yet is not such an obstacle to navigation, as here the river is not so wide and is consequently deeper. Judging from appearance, I should say that there was never less than from 3 to 4 feet of water in the centre or deepest portion of the rapid.

Grand Rapids are situated 166 miles below the Landing, are about two miles long, and I should estimate, at this season of the year, have a fall of about 65 feet, most of which occurs in about 30 chains. The river here has, through past ages, worn for itself a bed in the soft sandstone, about 300 feet deep. Thickly scattered over the face of the rapid may be seen spheroidal concretionary masses of sandstone, varying in size from a foot or two to 10 or 12 feet in diameter. These, harder than the surrounding masses, have offered greater resistance to the action of the water, and have remained standing on the slope of the rapid in numberless quantities, adding greatly to the roughness of the same. Midway in the rapid is a large timbered island, around which the waters sweep, and, converging below, rush through a channel not more than 100 yards wide, while above the island the river is from 500 to 600 yards in width. The rush of water through this channel is tremendous, and reminds one forcibly of the rapids below Niagara Falls. Standing on the east bank of the river, just at the narrowest part of the channel, and looking up at the wildly tumbling white waters dashing from rock to rock as they sweep around the fir-clad island, while on either hand stand the towering and almost perpendicular sandstone cliffs with their fringe of dark green fir apparently brushing the clouds, one sees a spectacle that inspires with awe and wonder, and one that an artist would love to look upon and feel to be worthy of the best touches of his brush. For a couple of miles below the rapids the waters are somewhat turbulent, but as far as I could see, deep and not dangerous.

Rapids de Roches are reached 194 miles below the Landing. These are short, the principal portion not being more than 250 yards in length; in this distance there is a fall of about 8 feet. The passage is rough and stony, and is impassable for canoes. York boats descending these rapids have to be lowered by means of ropes fastened on shore, several men being stationed in the boats with poles to guide. I may state here that this plan is followed in the passage of all difficult rapids on this

river. Should it ever be necessary, a single lock will overcome the difficulties here met with.

Long Rapids are 214 miles from the Landing. They are about eight miles in length, and are composed of three distinct rapids, with a fall in the first of about 26 feet; in the second of about 8 feet; and in the third of about 12 feet, or of about 46 feet in all. There is a space of about half a mile between the first and second, and of about a mile between the second and third. The first is the largest, while the last is the most difficult of descent, as numerous fragments of sandstone are scattered through it. It was in the second of these three rapids that the accident occurred by which I lost one of my men.

At 226½ miles the Crooked Rapids are to be met with. These are three miles in length, and the chief portion in shape resembles a horse shoe magnet. The fall is about 25 feet, and is dangerous on account of the water rushing to the outside of the curve, making it very rough there, while the inside is comparatively smooth. Boats descending keep to the inside, and are lowered by the aid of ropes as before mentioned. In these rapids may be found two ledges of rock, one at the head and the other at the foot, reaching almost across the river, and over which the water drops almost perpendicularly a distance of 2½ or 3 feet. These would, I believe, prevent any large boat passing, unless the water was very high.

The head of the Cascade Rapids is reached at 235 miles below the Landing. These rapids are two and a quarter miles long, and are composed of four ledges of rock which run across the river at intervals and form four cascades of from 3 to 4 feet fall each, the total fall being about 20 feet.

The rapid known as La Roche commences at a distance of 244 miles, and is about a mile and a quarter long. At the head of this rapid are two cascades similar to those in the Cascade Rapids, each with a fall of about 3 feet. The total fall is about 12 feet.

The last rapid is situated at a distance of 251 miles below the Landing. It is short and not very difficult of descent. With ordinary care canoes can make the passage.

Between the above mentioned rapids may be found many others, some of which require care in descending with canoes, but none present the same difficulties as those already mentioned. I might also say that from Rapids de Roches to Fort McMurray it is almost one rapid.

From the last rapid to Lake Athabasca, a distance of about 170 miles (from ten to fifteen miles more by the steamboat channel), the river is navigable for river, if not for lake, steamers; and during the last summer several trips were made by the Hudson Bay Company's boats from Fort Chippewyan to Fort McMurray without any difficulty; also one or two trips were made about forty miles up the Clearwater River.

The width of the river from the mouth of the Pembina, about 100 miles above the Landing, to the confluence of the Clearwater at Fort McMurray, a distance of 252 miles below the Landing, varies from 300 to 500 yards; while from Fort McMurray to where the river commences the formation of its delta, near the lake, a distance of 150 miles, the width varies from 400 to 800 yards. From the last mentioned point, namely, where the river commences the formation of its delta, to the lake, the width in many places exceeds a mile, while sand bars and islands are so numerous as to make it difficult in many places to tell which are the main shores.

Numerous streams flow into the Athabasca, but with the exception of the Little Slave, the Clearwater and the Red Rivers, none exceed 50 yards in width, and are for the most part rushing torrents for miles above their mouths. The Little Slave and Red Rivers are about 100 yards wide, while the width of the Clearwater is from 150 to 200 yards.

Between the Landing and Fort McMurray the banks of the river are never less than 300 feet in height, and in many places rise 400 or 500 feet, and are often precipitous. Below Fort McMurray the banks seldom rise to the height of 100 feet, and gradually get lower and lower, until the lake is reached, where they do not exceed a few feet in height.

The banks here are almost continually being washed away, the trees which grow along them being deposited in the streams to such an extent that in many of the bends it is almost impossible to force a passage for canoes. In this way the lower part of the river is slowly and continually changing its bed, and carrying what was formerly the bottom of the lake down to form a bottom for it as it now exists. Here one can easily trace in the banks the layers of sand, gravel, clay, leaves, limbs, &c., that were deposited in this flat when the lake was much larger than at present.

With the exception of the channel worn by the flow of the river, the lake, for miles out, does not exceed 3 feet in depth, and is constantly getting more and more shallow by the depositing of sediment from the dirty waters of the river, which, during the summer months, are thick with sand, clay and other matter. By placing the ear close to the edge of a boat when floating quietly in the stream one can distinctly hear the noise made by these particles rubbing against one another. The average rate of current of the Athabasca, when the water is at the ordinary height, is four miles an hour.

8th Question:—A. I have no personal knowledge of this river. It was examined by Mr. R. McConnell of the Geological Survey last autumn, but no report has yet been received. Authentic particulars may no doubt be obtained from the Hudson Bay Company. (See also Franklin's expeditions, Sir J. Richardson, Capt. Back, &c.)

9th Question:—A. From its mouth at Fort Simpson this river (according to preliminary notes received from Mr. McConnell) is probably navigable for steamers in a southerly direction, for about 200 miles, or the mouth of the Nelson or East branch. The river above this place to the mouth of the Dease is generally very swift and dangerous, with numerous narrow canons. The Devil's Portage four miles long over a mountain 1,000 feet high. This part of the river is navigable for boats only with great difficulty and had always been accounted the most dangerous in the region. The south west branch of the Liard known as the Black Turnagain, or Mud River, is reported to have a moderate current and may prove of use as a means of communication. The Liard above the mouth of Dease and the Francis River, its main tributary, were ascended by me in boats last summer. There is one bad canon just above the mouth of Dease and two in the Francis, and these streams could only be navigated by steamers for short lengths. The Dease River, about 140 miles in length and falls 560 feet in that distance. There are several rapids and it is scarcely navigable for steamers under most favorable circumstances. It is navigated by large flat-bottomed boats. At its head, on Dease Lake, in Cassiar District, is a small steamer. Total length of lake about 26 miles. Francis Lake at the head of river of same name, with two arms; total navigable length about 54 miles.

10th Question:—A. Trustworthy information respecting this river from Athabasca Lake to Dunvegan will be found in detail in report by Mr. Ogilvie (Interior Department Report, 1884, Part II, p. 49 *et seq.*) the following is a summary:—

	Miles.
Fort Chippewyan in Athabasca Lake to Peace Point... ..	86½
do do head of L. Rapids	100½
do do Falls.....	234
do do Battle River	436
do do Smoky River.....	541
do do Dunvegan	604

Little Rapids, 3½ miles long; total fall about eight feet.

Falls, perpendicular drop of 9½ feet, but sloping descent on one side used by boats. Just above the falls is a rapid one-third of a mile long, fall of eight feet. 1½ miles above the falls, rapid three hundred yards long, fall of eight feet. York boat and scows pass up and down through all these, and Ogilvie states that with the exception of Little Rapids, falls and rapids near them, and two shoal places, one near mouth of Smoky River, one between Smoky and Dunvegan, the river is navigable at low water throughout for boats drawing five to six feet of water. Above Dunvegan it appears that there are no serious impediments to steamer navigation to the Rocky Mountain Portage, a distance of about 135 miles. Adding this to Mr. Ogilvie's

distances above given, the navigability of the Peace River for a steamer of good power drawing say four feet of water may be thus expressed.

	Miles.
Fort Chippewyan to Little Rapids.....	97
Little Rapids possible interruption of.....	3½
Little Rapids to falls.....	134
Falls and rapids, making break of.....	1½
Head of rapids to Dunvegan	368½
Dunvegan to Rocky Mountain Portage.....	125

Thus, provided means are adopted for overcoming these impediments, the Peace might afford a length of steamer navigation of about 740 miles.

At the Rocky Mountain Portage is an impassable canon ; portage 12 miles. This constitutes head of steamer navigation, as from this place to west side of Rocky Mountains (about 83 miles) there are several bad rapids.

The Peace is formed by the confluence of the Finlay and Parsnip Rivers west of the mountains. There are streams of about 500 feet wide. From the confluence of the Parsnip might possibly be navigated by a small steamer for fifty or more miles southward, but is swift and shoal and not well adapted for such navigation. Little is known of the Finlay but much bad water is reported.

The Smoky River from latitude 55° to its mouth flows in a valley 400 to 600 feet deep, half a mile wide in the bottom and two to three miles from rim to rim. The banks are open and grassy on southern exposures. The current is swift and there are many small rapids, so that it can scarcely be considered navigable for steamers of any kind, though it is possible that a steamer of light draught might ascend some distance at high water. (Refer to Mr. Ogilvie's report for all particulars below Dunvegan. To reports by Selwyn, Horetzky, Macoun, Cambie and Dawson for river above Dunvegan

12th Question :—A. Sir J. Richardson states (Journal of a Boat Voyage, I, p. 208) that notwithstanding the existence of rapids at two places below the mouth of Bear Lake River (first and second rapids of Mackenzie) that the Mackenzie River might be navigated in the earlier part of the summer by steam vessels of considerable burden from the Portage of the Drowned on Slave River, to the sea—a distance of 1,200 to 1,300 miles. This has, I believe, been practically established last summer, by the success of a steamer belonging to the Hudson Bay Company.

Questions, 13, 14, 15 and 16 :—A. I have no personal knowledge of these lakes which are known to me only through published Reports ; and works of Franklin, Richardson, Back, Petitot and others.

Question 19 :—A. See reports of Dr. R. Bell, Geological Survey, Narrative of an expedition to shores of Arctic Sea, Dr. J. Rae. Reports of expeditions to Hudson Bay by Captain Gordon.

Question 20 :—A. This country is practically unknown except where covered by Back's route from Great Slave Lake to north of Great Fish River. It was travelled by Samuel Hearne near the end of last century, but his account is very meagre, and the rivers and lakes as shown by him evidently very incorrect. His map is still, however, the only one available for the greater part of the district. Lieutenant Schwitka and Dr. Rae have made some additions between N.W. part of bay and Arctic coast.

Question 21 :—A. Much scattered information exists on this subject in various works. I would respectfully suggest that a compilation and discussion of the whole should be undertaken by some competent meteorologist. The notes in their present form are of little value, but might be rendered available in the way indicated.

Question 22 :—A. The same remark applies to this question as to the last.

Question 24 :—A. The western outline of the Archaean formation on the accompanying geological map (Geological map of the northern part of the Dominion of Canada west of the Rocky Mountains) may, I believe, be taken generally as indicating the western border of the barren grounds, and as separating them from the Mackenzie valley in which cultivable land, forest areas, &c., occur. (See in this connection map by Abbé Petitot in Bulletin de la Société de Géographie, 1875, p. 278.

Richardson places the southern limit of barren ground at latitude 61 on the shore of Hudson Bay).

Question 25:—A. I can add nothing to the descriptions of Richardson, Hearne and Back. (See especially "The Polar Regions" by Sir J. Richardson, p. 263.)

Question 26:—A. In the Mackenzie valley, according to Sir J. Richardson, barley ripens well at Fort Norman, latitude 65°, 92 days after being sown. All attempts to cultivate barley 2° further north have failed. Good potatoes are reported (by F. W. Hart) to be grown at Fort Nelson about latitude 59° on Liard River. Potatoes are very successfully grown on Stikeen River east of Coast Mountains in northern British Columbia, latitude 58°. Barley is also grown at this place. Potatoes also grow (Vide Richardson) at Fort Simpson and Fort Norman, but are of inferior quality.

Question 27:—A. Wheat is reported by Richardson to be raised with profit at Fort Liard, on Liard River, but owing to frosts it does not ripen perfectly every year. This place was, last autumn, by Mr. McConnell, determined to be in lat. 60-14. Wheat can also be grown on the Stikeen River, near Telegraph Creek, lat. 58 deg.

Question 29:—A. I would respectfully suggest that a digest and tabulation might be made of the numerous general records which exist for various forts, &c. The information thus rendered available could not fail to be of great value and would furnish the best and most complete answers to this and following questions.

Question 30:—A. The information on these points which I am able to give for the Peace River region west of the mouth of Smoky River is embodied in the excerpt of my report of 1879-80 which accompanies this. Some additional information of a later date is also to be found in the report of Mr. W. Ogilvie, an extract from which is also attached.

Question 50:—A. The winds have long been known to occur as far north as Fort Simpson, and observations by Abbé Petitot appear to show that they extend quite to the mouth of the Mackenzie. (See Bulletin de la Société de Géographie, 1875, p. 205.)

Question 52:—A. Reindeer. Cattle possibly during two or three months in summer. As before stated we really possess very little definite or authentic information respecting the barren grounds generally.

Question 53:—A. The caribou and moose are the most valuable animals regarded as food, in the entire Mackenzie Basin. The musk ox appears to be practically confined to the barren grounds east of the Mackenzie Valley and to the Arctic Archipelago. Richardson states that the northern limit of the elk or wapiti was in his time on the Hay River. The woodland buffalo was at the same date very abundant in prairies near Hay River, Salt River, &c., and small herds are reported still to exist. Six of the animals were seen by the Indians at Pouce Coupée prairie, south of Peace River in 1879.

Question 58:—A. See answer to question 5.

Question 59:—A. With the class of steamers necessary for the navigation of the Mackenzie, I should consider it doubtfully profitable to endeavor to carry heavy freight such as whale or seal oil, &c., for long distances up stream. I think it probable that the coast fisheries might be more advantageously utilized in the manner indicated in answer to question 5.

Question 60:—A. Richardson describes the white spruce as attaining a girth of four or five feet, and a height of 60 feet in Mackenzie Valley as far north as Bear Lake River. One tree in that locality measured 122 feet in height. It appears that the white spruce is the most abundant tree throughout the Mackenzie Valley, and its wood is fairly good for all constructive purposes.

Question 65:—A. Extends north of the Arctic circle and west nearly to the Pacific coast.

Question 66:—A. I do not consider this plant a useful substitute for tea. It does not possess the peculiar alkaloid principle which renders tea valuable. Its qualities are merely due to an aromatic gum or resinous principle.

Question 67:—A summary of all available information called for in this and the two following questions is contained in my report entitled: "Notes to accompany a

Geological Map of the Northern part of the Dominion of Canada, East of the Rocky Mountains," of which a copy is herewith transmitted.

Question 76:—The service berry, high bush cranberry, swamp cranberry, raspberry, strawberry and various species of blueberry, are the only fruits sufficiently abundant to be of importance. The first mentioned is of more value as food than any of the others. It is extremely abundant in the Peace River country, especially in Grande Prairie.

Question 77:—A. The pitch may probably be of considerable value in the future, but it is most important in giving reason to believe that extensive deposits of petroleum exist in the country in which it occurs. In Report of Progress, 1881–1882, p. 34, Mr. Hoffman reports on an examination of this material. He suggests its use for asphaltting roadways, &c., and for the purpose of distillation, and the production of lubricating and illuminating oils.

Question 78:—A. From the reports of Sir J. Richardson, Prof. Macoun and Dr. R. Bell, to which reference should be made, the quantity is very great, I should suppose practically inexhaustible.

Question 79:—A. By one or two of the railway routes suggested under question three. A large market would exist in the southern portions of the prairie country, but an even more important and immediate market could be obtained in various ports of both sides of the Pacific Ocean.

Question 80:—A. Possibly ten thousand dollars, exclusive of salaries of superintendent and foremen. I would suggest the Athabasca valley near the "Landing" or the vicinity of Lesser Slave Lake as the most accessible places for first attempts. Several oil springs are reported in this district.

Question 81:—A. I am inclined to think that this fine gold has come from the north and east with the boulder drift. Mr. J. B. Tyrrell has, however, lately advanced arguments in favor of the theory that it was derived from the Selkirk Mountains at a time antecedent to the formation of the Rocky Mountains proper. His views are worthy of consideration.

Question 89:—A. Under proper regulations a good effect. These woodland Indians are more amenable to civilization than those of the plains.

Information bearing on extent of arable and pastoral land, &c., in the region of the Peace and Athabasca Rivers from report by Dr. G. M. Dawson, 1879–80, and Mr. W. Ogilvie, 1884:

Extract from Report by Dr. G. M. Dawson.

GENERAL PHYSICAL AND CLIMATIC FEATURES OF THE PEACE RIVER COUNTRY.

As the district of country defined on page 46 B, to the description of which the succeeding pages up to this point have been devoted, is bounded to the south by the Athabasca, it may be well here briefly to review the character of this great tract of the Peace River basin, and discuss what facts we possess as to its climate. As already noted its area is about 31,550 square miles. Its average elevation may be stated as a little over 2,000 feet, and this is maintained with considerable uniformity, for though the general surface slopes slightly from the north and south toward the Peace River, the region as a whole may be considered as a plateau, through which the great gorge-like valley of the Peace has been excavated. This valley has in general a depth of 600 to 800 feet below that part of the plateau bordering it, with a width of two or three miles from rim to rim. Its tributary streams, at first nearly on the plateau level, flow in valleys of continually increasing depth as they approach that of the Peace River. Those from the south-eastern portion of the region, rise either in the Rocky Mountains or near the Athabasca, the tributaries received by the latter stream, in this part of its course, from the north and north-west being—with the exception of the Baptiste—quite inconsiderable.

The ridges and hills by which this region is occasionally diversified, appear in all cases to be composed either of the generally soft rocks of the Orsetaceous, or of arenaceous clays containing erratics and representing the boulder clays of the glacial

period. These elevations are generally slight, and with exceedingly light and gradual slopes, the scarped banks of the streams constituting much more important irregularities. These ridges, however, often resemble detached portions of a higher plateau, and spread widely enough to occupy in the aggregate a considerable area, of which the soil is not so uniform in character as elsewhere. With these exceptions, the soil of the district may be described as a fine silt, resembling the white silts of the Nechacoo basin previously referred to, and not dissimilar from the loess-like material constituting the subsoil of the Red River Valley in Manitoba. This silt, at a short distance below the surface, is greyish or brownish in color, but becomes mixed superficially with a proportion of vegetable matter to a varying depth. It has evidently been deposited by a comparatively tranquil body of water not loaded with ice, probably toward the close of the glacial period, and has either never been laid down on the ridges and undulations above referred to, or has been since removed from them by processes of waste. As evidenced by the natural vegetation its fertility is great.

West of the Smoky River, both to the south and north of Peace River, there are extensive areas of prairie country, either entirely open, and covered with a more or less luxuriant growth of grass, or dotted with patches of coppice and groves of trees.

The northern banks of the Peace River valley, are also very generally open and grassed, and parts of the valley of the Smoky and other rivers have a similar character. The total area of prairie land west of the Smoky River, may be about 3,000 square miles. The remainder of the surface is generally occupied by second-growth forest, occasionally dense, but more often open and composed of aspen, birch and cottonwood, with a greater or less proportion of coniferous trees. Some patches of the original forest remain, however, particularly in the river valleys, and are composed of much larger trees, chiefly coniferous, among which the spruce is most abundant. Handsome groves of old and large cottonwoods are also to be found in some of the valleys. Where the soil becomes locally sandy and poor, and more particularly in some of the more elevated parts of the high ridges above described, a thick growth of scrub pine and spruce, in which the individual trees are small, is found; and in swampy regions the tamarac is not wanting, and grows generally intermixed with the spruce.

East of the Smoky River, and southward toward the Athabasca, the prairie country is quite insignificant in extent, the region being characterized by second-growth woods of the kind just described, which, on approaching the Athabasca, are replaced by extensive and well nigh impassable tracts of *brûlé* and windfall, in which second-growth forest is only beginning to struggle up.

Though the prairies are most immediately available, from an agricultural point of view, the regions now covered with second-growth and forest, where the soil itself is not inferior, will eventually be equally valuable. The largest tract of poor land is that bordering the valley of the Athabasca on the north. This rises to an elevation considerably greater than most of the region to the north and west, and appears during the submergence to which the superficial deposits are due, to have been exposed to stronger currents which have prevented the deposition of fine silt, causing it to be replaced by a coarser silt which passes in places into actual sand, and alternates with ridges of boulder clay. This region is often swampy, and for a width of twenty to 25 miles on the trail for Sturgeon Lake to Athabasca is quite unsuited for agriculture, though still in many places capable of yielding good summer grazing when the forest has been completely removed by fire. To the northward, more particularly to the east of Smoky River, peaty and mossy swamps occupy part of the surface, and these may be regarded as permanently unsuited to agriculture.

There is also a sandy tract, though of small width, along the lower part of the Wapiti River near its junction with the Smoky. Deducting as far as possible, all the areas known to be inferior or useless, with about twenty per cent. for the portions of the region under consideration of which less is known, the total area of land, with soil suited to agriculture, may be estimated as at least 23,500 square miles. In the absence of complete maps, such an estimate cannot be otherwise than very rough, but may serve to give some idea of the fact.

Whatever theory be adopted, and may have been advanced, to account for the wide prairies of the western portion of America further to the south, the origin of the prairies of the Peace River is sufficiently obvious. There can be no doubt that they have been produced and are maintained by fires. The country is naturally a wooded one, and where fires have not run for a few years, young trees begin rapidly to spring up. The fires are, of course, ultimately attributable to human agency, and it is probable that before the country was inhabited by the Indians it was everywhere densely forest-clad. That the date of the origin of the chief prairie tracts now found is remote, is clearly evidenced by their present appearance, and more particularly by the fact that they are everywhere scored and rutted with old buffalo tracks, while every suitable locality is pitted with a saucer-shaped "buffalo wallows." In its primitive state, the surface was probably covered with a dense and heavy growth of coniferous trees, principally the spruce (*Picea Engelmanni* and *P. alba*) but with scrub pine (*Pinus contorta*) in some localities, and interspersed with aspen and cottonwood. These forests having been destroyed by fire, a second growth, chiefly of aspen, but with much birch in some places, and almost everywhere a certain proportion of coniferous trees—chiefly spruce—has taken its place. The aspen being a short-lived tree, while the spruce reaches a great age and size, the natural course of events, if undisturbed, would lead to the re-establishment of the old spruce forests.

The luxuriance of the natural vegetation in these prairies is truly wonderful, and indicates, not alone the fertility of the soil, but the occurrence of a sufficient rainfall.

With regard to the climate of the Peace River country, we are without such accurate information as might be obtained from a careful meteorological record, embracing even a single year, and its character can at present be ascertained merely from notes and observations of a general character and the appearance of the natural vegetation.

It may be stated at once that the ascertained facts leave no doubt on the subject of the sufficient length and warmth of the season, to ripen wheat, oats and barley, with all the ordinary root crops and vegetables, the only point which may admit of question being to what extent the occurrence of late and early frosts may interfere with growth. This remark is intended to apply to the whole district previously defined, including both the river valleys and the plateau.

The summer season of 1879 was an unusual one, characterized by excessively heavy rainfall, with cold raw weather in the early summer months. These conditions did not extend to the west of the Rocky Mountains, but appear to have been felt over the entire area of the plains to the Red River valley. As a result of this, the crops generally throughout the North-West were later than usual, and the mean temperature of even the latter part of the summer appears to be rather abnormally low. Notwithstanding this, on my arrival at Dunvegan, on the 16th of August, small patches of wheat and barley in the garden of the fort presented a remarkably fine appearance and were beginning to turn yellow. On my return to the fort on 31st August these were being harvested, their complete ripening having been delayed by overcast and chilly weather which prevailed between these dates. At the first-mentioned date potatoes were quite ripe, with the balls formed on the stalks, and the garden contained also fine cabbages, cauliflowers, beets, carrots, onions, lettuce and turnips. Dwarf beans, cucumbers and squashes were also flourishing, and though these plants are particularly tender, showed no sign of frost. The two last-named having been sown in the open ground did not appear likely to perfect their fruit. A few stalks of Indian corn were also growing, though it is improbable that this cereal would ripen in this district.

When this garden was again visited, on the last day of August, the beans, cucumbers and squashes had been cut down by frost, but not completely killed. The potato tops were also slightly nipped.

Rev. Mr. Tessier, who has been at Dunvegan as a missionary for some years, has always been able to ripen small, black butter beans, but in some seasons not without difficulty owing to frosts. He had also tried a few grains of oats which he procured

accidently, and obtained a return of astonishing abundance. About the date just referred to the potato plants of Smoky River post (The Forks) were badly cut down by frost, the tubers being, however, quite ripe, fine and large.

On the 15th September, Mr. R. McConnell, found the potatoes in the garden of the fort at the west end of Lesser Slave Lake, and on the level of the plateau, little affected by the frost, with tubers large and ripe. Mr. H. J. Cambie also ascertained that wheat thrives at this place. We found some rude attempt at cultivation also at the "Cree Settlement," previously referred to, which is at the average level of the plateau, with an elevation of about 2,000 feet. Here, on 14th September, the potato plants were slightly affected by frost, but not more so than observed at Dunvegan two weeks before. The tubers were quite ripe, but the Indians did not intend to dig them for about ten days. Turnips were very fine, and carrots, beets and onions were good, though evidently cultivated with very little care. Two or three very small patches of barley had been almost completely destroyed by mice, but a few stalks remaining were quite ripe and with fine heads. The Indians here were very anxious to have a supply of garden seeds, which I have since been able to forward to them by the kindness of Messrs. Stobart, Eden & Co., of Winnipeg.

At Fort St. John, ninety-five miles west of Dunvegan, and so much nearer the mountains, on 26th July, 1875, Professor Macoun states that potatoes, oats, barley, and many varieties of vegetables were in a very flourishing state in "Nigger Dan's" garden. The oats stood nearly five feet high, and the barley had made nearly an equal growth.* The barley and oats were both ripe about the 12th of August. Prof. Macoun was informed by Charlotte at Hudson's Hope, thirty miles further west, that in 1874 there was no frost from the 1st of May until the 15th of September. In 1875 sowing commenced the last week in April. There appears to have been a frost on 28th of June, but the first autumn frost occurred on the 8th of September, and Mr. Selwyn found the potato tops still green in the middle of the month. Mr. H. J. Cambie saw wheat flourishing here in July last, but on his return in September it had been cut down by frost.

Such are the notes that can be obtained on the growth of cereals and vegetables in the district in question. From information obtained at Dunvegan, it seems that the snow disappears about the middle of April, westerly winds sweeping it away fast. The river opens at about the same time. Cultivation begins at about the end of April or first of May. The river generally begins to freeze in November. The depth of snow, I was told, averages about two feet, an estimate which agrees with Mr. Horetzky's statement.† Mr. Horetzky was also told that the plains were often nearly bare up to the month of December, though the winter usually sets in with the month of November. Sir Alexander Mackenzie remarked the same absence of snow in the early winter months of 1792. It was entirely gone on 5th April, 1792, and gnats and mosquitoes were troublesome on 20th April.‡ Horses almost invariably winter out well without requiring to be fed. Hay should be provided for cattle, to ensure perfect safety, for a period of three or four months, though in some seasons it is necessary to feed the animals for a few weeks only. The Indians of the "Cree Settlement" on Sturgeon Lake, previously referred to, winter their horses without any difficulty round the borders of a neighbouring lake, the shores of which are partly open. From Hudson's Hope, the horses are sent southward to Moberly's Lake to winter, and according to Mr. Selwyn, do well there. Lesser Slave Lake, with its wonderful natural meadows, has long been known as an excellent place for wintering stock, and is referred to as such by Sir. J. Richardson.

Some general idea of the length and character of the seasons at Fort St. John may be gained by an examination of the extracts from the journals from 1866 to 1875, published by Mr. Selwyn.§ The dates of opening and closing of Peace River,

* Report of Progress, Geol. Survey of Canada, 1875-76, p. 154.

† Canada on the Pacific, p. 205.

‡ Voyages, p. 131-132.

§ Report of Progress, Geol. Survey of Canada, 1875-76, p. 84.

being an important clue to the mean temperature of the region, may be quoted as summarized by Prof. Macoun in the same report (p. 156):

Ice breaking	Ice drifting, first time
1866, April 19.....	Nov. 7.
1867 do 21.....	do 8.
1868 do 20.....	do 7.
1869 do 23.....	do 8.
1870 do 26.....	No record.
1871 do 18.....	Nov. 10.
1872 do 19.....	do 8.
1873 do 23.....	do 4.
1874 do 19.....	Oct. 31.
1875 do 16.....	

The average date of the breaking up of the ice may thus be stated to be April 21st; that on which ice is running in the river for the first time, November 7th. In 1792-3, when wintering at the mouth of Smoky River, Sir Alexander Mackenzie observed the ice to be running for the first time on November 6th, while the river was clear of ice on the 25th April. I have been unable to find any precise records of the dates of closing and opening of the Saskatchewan, but Dr. Hector states these are usually the second week of November and the second week of April, respectively. The Saskatchewan is a more rapid stream than the Peace.

With regard to the probable difference between the actual valley of the Peace, and the plateau forming the general surface of the country, Prof. Macoun observes,*

* *Op. cit.*, p. 155.

speaking of the vicinity of Fort St. John, that notwithstanding the difference in altitude, the berries on the plateau ripened about a week only later than those near the river, while he was informed that there was about the same difference in the time of disappearance of the snow in spring. While at Dunvegan, I ascertained that a similar difference was observed there, but it was added that this obtained chiefly with the wooded parts of the plateau, the snow disappearing on the prairies much about the same time as in the valley. In my diary, under date September 5th. I find the following entry:—"Aspens and berry bushes about the Peace River valley now looking quite autumnal. On the plateau, 800 or 900 feet higher, not nearly so much so. Slight tinge of yellow only on some aspen groves." This difference, though not altogether constant and depending much on diversity of soil, appears to be actual. In October, 1872, Mr. Horetzky writes: † "We observed that, curiously enough, the vegetation upon these uplands did not appear to have suffered so much from the effects of frost, this being probably due to the fact of the air in these upper regions being constantly in motion, while in the deep and capacious valley of the river the winds have often no effect."

The difference between the valley and the plateau being thus very small, I have not treated separately the observations for temperature taken by myself in the different situations. Most of the observations, however, refer to the plateau; and including the whole time spent in the country, from the Middle Forks of Pine River to the bank of the Athabasca, cover a period of nearly two months. The mean minimum temperature for the month of August, deduced from observations extending from the 6th to the 31st of the month, is 39.9°. The mean of observations at 6 a.m. during the same period is 42.3°. That of the observations at 6 p.m., 59.5°. In September the mean minimum temperature was 28.1°. The mean of morning observations 34.3°, of evening observations 51.5°. I have endeavored to deduce from these observations mean temperatures for the months in question, by correcting them by the tables of hourly variations in temperature given by C. A. Schott, in the Smithsonian Contributions to Knowledge (No. 277), but find it impossible to do so, as the daily range is here so much greater than that of any of the places represented by the tables, which refer chiefly to the eastern portion of the continent. It would appear,

† Canada on the Pacific, p. 44.

that while in most places the mean temperature of the day is reached about 8 p.m., it is found in the Peace River country not far from 6 p.m., by reason of the increased rapidity of loss of heat by radiation due to greater elevation and dryer atmosphere. The maximum temperature was seldom observed, but the daily range is very great, and the maximum probably several times reached 80° in August, and often surpassed 70° in September.

From the 6th to the 31st of August I registered two nights of frost, on the 13th and 20th of the month, when the thermometer showed 32° and 26°, respectively. Both of these were observed on the plateau, but one at least of them (that of the 20th) must have occurred also in the valley, from the effects produced at Dunvegan on tender vegetation. These frosts occurred in very fine weather, following a day of strong westerly wind, the result of which is to remove from the surface of the earth the whole of the lower heated layer of the atmosphere. This, succeeded by a calm and cloudless night with transparent sky, causes the thermometer to sink below the freezing-point before morning. When not preceded by strong wind, mere transparency of the atmosphere seems seldom or never to lead to frost in August, in this district, as many beautifully starlight nights without an approach of the mercury to the freezing point were experienced.

Though in some cases such frosts as these may be general, and extend over a wide district of country, it is more usually found that they are quite local in character. A few floating clouds, or light wreaths of mist, may arrest radiation so far as to prevent frost over the greater part of the country, while some spot accidentally exposed during the whole night under a clear sky, experiences a temperature below 32°. The contour, and character of vegetation of the country, also have much to do with the occurrence of frosts, and it is very frequently the case that river valleys are more subject to frosts than the upland districts. During the month of September, in a region for the most part wooded, and often above the average altitude, between Dunvegan and the Athabasca, nineteen frosts were registered, the actually lowest temperature being 20° on September 18th.

Through the kindness of Colonel Jarvis, of the North-West Mounted Police, I have been able to secure a copy of records kept by Dr. Herohmer, of Fort Saskatchewan, on the Saskatchewan River, about twenty miles north-east of Edmonton. For comparison with the observed temperatures in the portion of the Peace River country now discussed, they are invaluable; for in the whole district surrounding Fort Saskatchewan and Edmonton we now know, from actual and repeated experiment, that wheat and all other ordinary cereals and vegetables thrive, and yield most abundant crops. The climate, in its great diurnal and annual range, corresponds exactly with that of the Peace River country. Fort Saskatchewan is situated on the brow of the Saskatchewan valley, about seventy feet above the river, and therefore probably less liable to frosts than either the bottom of the river valley or extensive flat tracts of plain, where there is little circulation of air. This, with the position of the thermometers in regard to the buildings, leads to the belief that if at all in error, as representing the climate of the region generally, the indicated temperatures are slightly too great. The thermometer appears to have been read in all cases to the nearest degree only.

A comparison may be made between the temperature observed in the Peace River country during August and September, with those at Fort Saskatchewan, as follows:—

Peace River country, mean of minima during	August.....	39 9°
do do do	September....	28 1°
do frosts experienced during	August.....	3
do do do	September....	19
Fort Saskatchewan, mean of minima during	August.....	39 3°
do do do	September....	31 1°
do frosts experienced during	August.....	0
do do do	September....	15

Fort Saskatchewan, mean of maxima during	August.....	77.6°
do do do	September....	68.1°
do deduced mean temp. of	August.....	58.6°
do do do	September....	49.6°

The mean of maxima and actual mean temperature for the months cannot be stated for the Peace River country. The actual mean for Fort Saskatchewan is obtained by adding the minima and maxima for each month together, and is probably very nearly correct.

While regretting that the data at disposal for the determination of the agricultural value of the Peace River country are not fuller, we may, I believe, arrive with considerable certainty at the general fact that it is great. From such comparison as can be made, it would be premature to allow that the climate of the Peace River is inferior to that of the region about Edmonton on the Saskatchewan. It is true that in both the Saskatchewan and Peace River districts the season is none too long for the cultivation of wheat, but if the crop can be counted on as a sure one—and experience seems to indicate that it may—the occurrence of early and late frosts may be regarded with comparative indifference. The season is at least equally short throughout the whole fertile belt from the Peace River to Manitoba, though early and late frosts are not so common in the low valley of the Red River. The almost simultaneous advance of spring along the whole line of this fertile belt, is indicated by the dates of the flowering of the various plants, a point referred to by me in some detail elsewhere.* It is further unquestionable that the winter is less severe, and not subject to the same extremes in the Peace River and Upper Saskatchewan regions as in Manitoba.

We have already found reason to believe that the early and late frosts, and not the absence of a sufficient aggregate amount of heat constitute the limiting condition of wheat culture in the North-West; but that neither the Saskatchewan nor the Peace River countries lie upon the actual verge of the profitable cultivation of wheat appears to be proved by the fact that oats succeed on the Saskatchewan, and also—in so far as one or two seasons can be accepted as evidence—on the Peace River; while it is well known that this cereal is less tolerant of summer frost than wheat. This is further proved by the fact that at Fort Vermillion and Athabasca Lake, 180 and 300 miles, respectively, north-east of Dunvegan, Prof. Macoun found wheat and barley ripening well; but in this instance the fact is complicated by the circumstance of the decreasing altitude of the country, which introduces a new condition. As no knowledge has been gained of this country on the Lower Peace in addition to that collected by Prof. Macoun in 1875,† it is not included in the above discussion, though from it additional great areas might doubtless be added to the fertile tract.

Referring to the journals kept at Fort St. John, Mr. Selwyn, in the report already several times referred to, comes to the conclusion that the climate of the Peace River compares favorably with that of the Saskatchewan or Montreal.

To give some idea of the value of a tract of generally fertile country such as that now described, let us, assume, as above, that the area of actually cultivable land is 23,500 square miles, or 15,140,000 acres. Let us suppose, for simplicity of calculation, that the whole area were sown in wheat, the yield, at the rate of twenty bushels to the acre, would be 300,800,000 bushels.

The portion of the Peace River country embraced in the explorations of 1879, and treated of in this report, however, by no means includes the whole fertile tract, as the statements made regarding the lower part of the Peace by Prof. Macoun‡ and others show. Sir J. Richardson places the northern limit of the profitable cultivation of wheat in the Mackenzie valley, at Fort Liard, on the Liard River (lat. 60° 5' N.), while from trustworthy information obtained by Prof. Macoun, it appears that even at Fort Simpson, on the Mackenzie in lat. 61° 51', wheat succeeds four times out of five, and barley always ripens from the 12th to the 20th of August.

* *Geology and Resources of the 49th Parallel*, 1875, p. 279.

† *Report of Progress Geol. Survey of Canada*, 1875-76.

‡ *Report of Progress Geol. Survey of Canada*, 1875-76.

In the report of the Meteorological Department for 1876, a series of observations taken by Mr. J. S. Onions, at Fort Simpson, is printed. This, though extending merely from May to November, 1875, seems to show that the climate compares very favorably with that of the Upper Peace River. No frosts occurred from the 18th of May to the 10th of September. The mean temperatures of the months of growth are as follows, the figures in the first column being from the source just alluded to, those in the second from the appendix to Sir J. Richardson's "Journal of a Boat Voyage":—

	I.	II.
May.....	44·6	48·16
June.....	55·8	63·64
July.....	63·5	60·97
August.....	63·2	53·84
September.....	44·8	49·10

The figures differ considerably, but those under column I are probably the more accurate, as the second series depend on observations taken at 8 a.m. and 8 p.m., to which a correction of the kind previously mentioned as inapplicable to this western region has been applied.

It has often been stated, in a general way, that the cause of the exceptionally favorable climate of the Saskatchewan and Peace River countries, as compared with that of the eastern portion of the American continent, is to be found in the prevalence of warm westerly winds from the Pacific. Sir Alexander Mackenzie speaks of these westerly winds in winter, writing: "I had already observed at Athabasca, that this wind never failed to bring us clear, mild weather, whereas, when it blew from the opposite quarter, it produced snow. Here it is much more perceptible, for if it blows hard south-west for four hours a thaw is the consequence, and if the wind is at north-east it brings sleet and snow. To this cause it may be attributed that there is so little snow in this part of the world. These warm winds come off the Pacific Ocean, which cannot, in a direct line, be very far from us, the distance being so short that, though they pass over mountains covered with snow, there is not time for them to cool."*

Further south, these south-westerly currents are known as "Chinook winds," and similar consequences are observed to follow their occurrence. Sir Alexander Mackenzie, however, in the summer of 1793, found the distance to the Pacific coast from his wintering place at the mouth of Smoky River greater than he appears to have imagined at the time he penned the above-quoted remarks, and it is difficult indeed to understand how currents of air, blowing for at least 350 miles across a country which is for the most part mountainous, should retain enough warmth to temper effectually the climate of the plains to the east. This difficulty would appear to be particularly great in summer, when the mountains are largely snow-clad, and the mean temperature of the Peace and Saskatchewan valleys is probably considerably in excess of that of the region intervening between them and the sea.

The complete explanation is to be found in the great quantity of heat rendered latent when moisture is evaporated or air expanded in volume, but which becomes sensible again on condensation of the moisture or compression of the air.

The pressure in the upper regions of the atmosphere being so much less than in the lower, a body of air rising from the sea-level to the summit of a mountain range, must expand, and this, implying molecular work, results in an absorption of heat and consequent cooling. The amount of this cooling has been estimated at about 1° Centigrade for 100 metres of ascent when the air is dry, but becomes reduced to $\frac{1}{2}$ degree when the temperature has fallen to the dew-point of the atmosphere, and precipitation of moisture as cloud, rain or snow begins; the heat resulting from this condensation retarding to a certain degree the cooling due to the expansion of the air. When the air descends again on the further side of the mountain range, its

* Voyages, p. 133.

condensation leads to an increase of sensible heat equal to 1°C . for each 100 metres.* It is owing to this circumstance that places in the south of Greenland, on the west coast, during the prevalence of south-easterly winds, which flow over the high interior of the country, have been found, in winter, to experience for a time a temperature higher than that of North Italy or the south of France, though the North Atlantic Ocean from which the winds come, can, at this season, be little above the freezing point. The wind well known in the Alps as the foehn, is another example of the same phenomenon.

The data are wanting for an accurate investigation of the circumstances of our west coast in this regard, but a general idea of the fact may be gained. We may assume that the air at the sea level is practically saturated with moisture, or already at its dew point, that in crossing the mountainous region the average height to which the air is carried is about 2,000 metres (6,560 feet), and that it descends to a level of about 700 metres (2,296 feet) in the Peace River country. The loss of sensible heat on elevation would, in this case, amount to 10°C . (18°F .), the gain on descent to the level of 700 metres to 13°C . (23.4°F .). The amount of heat lost by the air during its passage across the mountainous region, by radiation and contact with the snowy peaks, cannot be determined. It is, of course, much greater in winter than in summer, and depends also on the speed with which the current of air travels. Taking the mean summer temperature of the coast at about 12°C . (54°F .) and allowing several degrees for loss by radiation, it becomes easy to understand how the western prairies may be flooded with air nearly as warm as that of the coast, though it has travelled to them over a region comparatively cold.

Owing to the great width of the mountain barrier, the main result is complicated by local details, regions of considerable precipitation occurring at each important mountain range, with subsidiary dryer regions in the lee. The last of these regions of precipitation is that of the Rocky Mountain Range properly so-called. In descending from this, a further addition of heat is made to the air, which then flows down as a dry and warm current to the east.

In addition to the favorable climatic conditions indicated by the thermometer, the length of the day in summer in the higher northern latitudes favors the rapid and vigorous growth of vegetation, and takes the place to a certain extent of heat in this respect. This has been supposed to be the case from the luxuriant vegetation of some northern regions, but Alfonse de Candolle appears to have put the matter beyond doubt by subjecting it to direct experiment. In latitude 56° , which may be taken as representing the position of much of the Peace River country, sunrise on the 21st of June occurs at 3h. 12m., sunset at 8h. 50m.; while six degrees further south, in latitude 50° , which may be assumed to represent Manitoba, sunrise occurs on the same day at 3h. 49m., sunset at 8h. 13m. The duration of sunlight is, in the first case, 17h. 38m.; in the second, 16h. 24m., or one hour and a quarter in excess in the northern locality. This excess, of course, decreases to zero at the spring and autumn equinoxes, and the difference is reversed in the winter.

In further illustration of this point, the following extracts from a note in the *American Journal of Science*, vol. xx, p. 74, may be cited:—"It is well understood that for a plant to complete its development and mature its seeds, a certain sum of heat is required, varying according to the species. It appears—as indeed might antecedently be expected—that we should rather say a certain amount of solar radiation; for light, to a certain extent, may replace temperature. This is shown in the effects of almost uninterrupted summer sunshine upon vegetation in high latitudes. According to Schübel, of Christiana, and others, barley ripens in eighty-nine days from the sowing in Finland, while it requires one hundred days in the south of Sweden, though the latter enjoys a considerably higher temperature. A grain of wheat grown at nearly the sea level in Norway, or in lower latitudes, when propagated at high elevations or in a high latitude, will mature earlier, even

*The figures are Dr. Hann's, quoted by Hoffmeyer in the *Danish Geographical Society's Journal* and reproduced in *Nature*, August, 1877.

although at a lower temperature; and it is said that, within limits compatible with its cultivation the grain increases in size and weight."

"Schübeler also makes out that grain, after several generations of cultivation in the highest latitudes or highest elevations compatible with its cultivation, will, when transferred back to its original locality, ripen earlier than grain which has not been moved. But it loses this precocity in a few generations, and the seeds gradually diminish to the former size and weight. Plants raised from seeds ripened in a high northerly locality are hardier than those grown in the south, and are better able to resist excessive winter cold."

A further circumstance giving to the Peace River country and that on the upper part of the Saskatchewan, other things being equal, a value as farming land acre for acre considerably greater than that of most parts of the North-West, is the immunity of this region from the visits of the devastating locust or grasshopper (*Caloptenus spretus*). I have elsewhere discussed the question of locust invasions, in several papers,* and it has since been taken up by the United States Entomological Commission.† It must suffice to state here, that while long series of years may pass without the occurrence of serious invasions, these must continue always, or at least for a very long time, to constitute a drawback to the whole territory lying south of a line drawn about sixty miles south of Edmonton, and thence nearly following the border of the wooded country southward and eastward to Manitoba.

Extract from Report by Mr. W. Ogilvie.

TIMBER.

The timber on the Athabasca, from Little Slave River down to McMurray, is generally small, and consists principally of "poplar, cottonwood, spruce, tamarac, pitch pine, small white birch, and occasionally a few balsams." There is also abundance of "underbrush, alder, willow and hazel." Alders and willows grow to a size which surprises people from the eastern part of the country. I have seen alders more than 8 inches in diameter, and 30 feet high, while willows are often seen one foot in diameter. I have met with one 16 inches in diameter.

The white birch is the only hardwood in the country of any use; but it is small and crooked, seldom more than 6 or 7 inches in diameter.

The pitch pine is generally small and scrubby. I saw little or none that would be of any value. It is only found on high sandy or gravelly knolls or ridges.

The tamarac is scarce and generally small. It is only found in marshes, and a great deal of it is hollow and unsound at the heart.

The spruce is plentiful, it and poplar being found in about equal quantities, and both greatly outnumbering all the others taken together.

It is generally found in groves by itself and, as a rule, it seldom exceeds 12 to 14 inches in diameter, and from 100 to 120 feet high.

There are many large groves of it that would make good useful timber, for any purpose for which this kind of timber is used, the trees being large, long and clean.

The poplar and cottonwood are generally small, but on many of the flats they are of a good size, sometimes large.

From McMurray down to the flats adjoining the lake the timber is nearly all spruce and poplar. There are a few ridges of pitch pine, which possesses no value.

Occasionally a few white birch are seen.

On the flats, around the lake, the timber is principally spruce, with a good deal of poplar and cottonwood, and a very few white birch.

The spruce are generally much larger here than on the upper portion of the river, and much more free from limbs and knots, and well suited for use. I have seen nothing to compare with it in any part of the Territories (adjoining the prairies) through which I have been.

* Canadian Naturalist, Vol. VIII, pp. 119, 207, 411.

† First Annual Report, United States Entomological Commission, 1878.

For three or four miles back of the lake, on the south side, there is nothing but willow and small poplar, which gradually merges into the large timber as we get back from the lake.

Around Fort Chippewyan, on the north side, the timber is generally small, and nearly all spruce and pitch pine; a small percentage of it only would be fit for use as lumber.

I learned from those who had been north of this point that the same features are to be seen through to Great Slave Lake.

On the Quatre Fourches River there is some very fine spruce, with groves of poplar, and a few pitch pine mixed through it.

On the Peace, up to Vermillion River, there is a great deal of first-class spruce, much of it being the best I have seen in the country.

The sandy and gravelly ridges here, as elsewhere, are covered with pitch pine. There is also much poplar and cottonwood, but it is generally small; mixed with this is a little white birch. I saw very little tamarac.

Above Vermillion River, as the banks get higher, the timber along the river becomes thinner and smaller until, near Battle River, many of the hillsides are bare, or covered only with scrub. Wherever a flat or a moderate slope occurs, the timber is generally of a fair size; therefore, I have reason to believe it is the same on the prairies back from the steep banks.

The timber from Battle River up to Dunvegan is thin and poor. In very few places could there be found much that would prove of any value.

Here, as on the Athabasca, the timber on the upper part is not to be compared with that found on the lower.

Agricultural Capabilities.

All the way down the Athabasca to the lake the country is (with the exception of a few meadows) thickly wooded, and a great deal of it swamp and marsh, interspersed with lakes and ponds.

A great deal of the soil along the bank was of very fair quality. At Fort Murray, where there is a couple of small prairies or meadows, the soil is good, and the root crops and garden produce raised there are generally very good.

To convert this into an agricultural country the forest would first have to be cleared, and considerable drainage would be required for a large portion of it, which would render the question of its settlement a problem for the future to determine.

From Lac la Biche to McMurray is a pack trail, which is occasionally used. It runs along the course of the Athabasca River, at a distance of from two to twenty miles. Those who have passed over it inform me the country is much the same as that seen along the river—woods and swamps, with a large percentage of marsh or bog; also quite a number of lakes.

The country on the west side of the river, as far as I could learn from Indians and the few white men with whom I came in contact who had been over it, was much the same, at least for fifteen or twenty miles back. I could learn nothing definite about anything much further back than that. The only approach to prairie along the Athabasca is where the House River flows into it (a few miles above Grand Rapids), where an extensive fire has almost cleared away the forest for a mile or two around this point. It is now covered with a good growth of grass and shrubbery. The soil appears to be very fair—a loamy clay—and were there any inducement to settlers, a few fine farms might be established. A meadow near McMurray is about sixty acres in extent, from which the Hudson Bay Company procure their hay. The soil is said to be good.

At a place called "Point Brulé," about ninety six-miles below McMurray, fire has partially cleared off the forest for some little distance from the river. A couple of families of Chippewyan Indians have taken possession of a small portion of it, and done a little cultivation in the way of planting potatoes. Their efforts were necessarily very crude, and the appearance of the crop bore witness to it.

It is a pity such attempts do not succeed, as one failure does more to dishearten the natives with agriculture than ten successes would do to encourage them.

The soil at this point was a gravelly clay, and with ordinary cultivation should yield pretty fair crops.

On the flats near the lake the soil is wholly alluvial; it is rich, but too low and damp for agricultural purposes.

On the north side of the lake, around Chippewyan, there is little or no soil of any description, the country being all bare Laurentian rock.

The Hudson Bay Company have a garden at the fort of upwards of an acre in extent, and the Episcopal Mission one of smaller area, but the soil is very sandy. The Roman Catholic Mission have a garden also, most of which they obtained by draining a bog into the lake.

In the season of 1833 (which was a pretty favorable one in that district, being free from summer frosts) the Hudson Bay Company raised about 400 bushels of potatoes, the Episcopal Mission 30 bushels on a small patch, and the Roman Catholic Mission about 500 bushels.

Many of the retired Hudson Bay Company's servants also have small patches which they cultivate, potatoes and fish being the principal articles of food used during the winter.

I am sorry to say that owing to the prevalence of summer frosts nothing like the above returns were expected by any of the parties aboved named last summer.

I believe one or two of the patches owned by Hudson Bay Company's retired servants escaped the frost, but the general effects were ruinous.

Ascending the Peace River until Peace Point is reached, the country is mostly low and flat, and the soil is lacustrine, like that on the Athabasca. Occasionally a sandy or gravelly ridge is seen, which must have formed a bar in the shallow waters of the great lake which once covered this district. The soil in the flats is good, but, like that in the flats on the Athabasca, it is too low and damp for agricultural purposes. On the north side of the river, at Peace Point the country is prairie, with poplar bluffs; and the same extends, I was informed by Indians, through to Salt River, in the Great Slave River district. The soil along the Peace River at this point is a black gravelly clay, with a coarse gravel subsoil; and, as nearly as could be learned from Indians, it is pretty much the same all the way through to Salt River, where there is quite an extensive prairie. This prairie was described to me by those who have seen it as one of the prettiest and best pieces of country in all the northern district. The country along the north side of the river, from Peace Point up to Vermillion, is generally heavily timbered, with occasional parts of open scrubby woods and small patches of prairie. On the south side the open woods and prairie are less frequent, until we reach a piece of scrubby prairie, which begins seven or eight miles below Red River and reaches to it, and runs back about two and a half or three miles, where it merges into the forest. The soil in it is good black loamy clay, about 1 foot deep, with a subsoil of fine sandy clay. The Hudson Bay Company here cultivate two or three acres, and when the summer frosts are not too severe the returns are splendid. This year the crop consisted of potatoes, turnips and garden stuff, which, notwithstanding the successive and severe frosts of the season, looked very well when I was there (the 22nd August), but Mr. McKenzie feared the yield of potatoes would be small, compared with that of last year, which was enormous. Usually a little barley and wheat has been grown there; this year none was sowed.

At Vermillion, along the river on the south side, there is about twelve to fourteen miles of prairie, with small poplar and scrub, which runs back from the river about three miles. The soil is a good black loamy clay, loose and deep, with a gravelly clay subsoil. The Episcopal Mission school at Vermillion, for the teaching of the young in the district, has a farm attached, with about twenty acres under cultivation, under the management of Mr. E. J. Laurence. Last year his crops of potatoes, barley and wheat were splendid; this year the frosts almost destroyed everything.

Mr. Garrioch, in charge of the Mission, also cultivates quite a large piece (from twenty-five to thirty acres) in connection with the Mission. The Hudson Bay Company

has an extensive field growing both roots and grain (wheat and barley); and the Roman Catholic Mission also cultivates some ground. Besides the above farms, several others were located last summer by private parties, all of whom seemed hopeful for the future. Many of them had been in the country for several years. Here, as at other places mentioned, no one expected to harvest much more than the seed sown, owing to the very unusual season, which was in the early part dry and warm, so that grain sown in April did not germinate until June, for want of moisture. In June the weather became very wet, and continued so all the summer, with frosts at frequent intervals. That this summer was unusually severe all were agreed, but all admitted that there was an uncertainty every year. Mr. Moberly, in charge of the New Brunswick Company's post here, who has lived in the country for several years, told me his experience for seven years stood as follows: Two years an unqualified success, two years failure such as the present, and three years a fair return.

Opposite Vermillion, on the north of the river, there is an extensive tract of prairie and poplar bluff country, which extends from the Peace to the watershed between the Peace and Mackenzie Rivers, south-westward along the Peace for about forty miles or more, and north-eastward along the river a few miles, until it merges into the country already described. This is said to be a first-class country in every way, well wooded and watered, with a rich, deep, black, loamy clay soil; and if the life of flowers and berries be any indication of freedom from frost, this district is favored in this respect, as the berries ripen here when they are killed in the surrounding parts.

The country south-westward from the end of this tract to Battle River is described as woods and swamps, alternating with patches of prairie and open woods, and from the Battle River to the prairie near Dunvegan generally drier and with more prairie.

It appears therefore, that from Dunvegan, on the north side of Peace River down the river to Peace Point, and thence to Salt River, on the Great Slave, there is a tract of country about 600 miles in length and forty miles wide, of which a large percentage is fit for immediate settlement, and a great deal more could be very easily cleared.

Of the country south-east of the Peace, between it and the Athabasca, very little is known. It was described by all whom I met, who had seen any portion of it, as a rolling surface, the ridges heavily wooded with fair timber, and many of the basins containing swamps and lakes of considerable size. Out of one of the latter, Lake Wapisca, the Loon River flows into the Peace, and another stream called by the same name into the Athabasca, at Grand Rapids. Some of the ridges rise into high hills, and in some of these rock exposures are said to be visible. Whenever the needs of the country make it worth the trouble, timber can be easily floated into the Athabasca and Peace Rivers by the numerous streams which enter them from this tract.

A little north-east of Vermillion, and between twenty and thirty miles from the river, is the west end of the Cariboo Mountains. They extend from this point eastward about sixty or seventy miles, and then appear to turn to the north. From a station a little below Vermillion, I took the angle of elevation of the highest point I could see in them, and found it to be $0^{\circ} 55'$, so that they must rise between 1,500 and 2,000 feet above the river. I saw no white man who had been in these mountains, except on a flying visit in the winter for trading, and then, of course, the most rugged parts would be avoided, and consequently very little observed of the rocks composing them. The Indians speak of the beautiful many-colored stones seen in them. Judging from what they say, I think the rocks are Laurentian, and the "beautiful stones" may be crystals. I was told they also speak of places on the north side of the mountains which smoke in the winter; but I have noticed that the Indians call all sorts of vapours "smoke," and what they call smoke may only be the vapour rising from springs.

At Dunvegan, notwithstanding the severity of the frosts, the crops were very good, both in quality and quantity. When I was there, the Roman Catholic Missionaries had threshed their grain, samples of which I brought back. The yield was as

follows:—50 pounds of wheat were sown on the 16th April and reaped on the 20th August, and 27 bushels threshed of good clean grain; 15 pounds of Egyptian barley sown on the 18th April and reaped 20th August, and 15 bushels threshed, weighing fully 69 pounds to the bushel. The Hudson Bay Company and Episcopal Mission had not threshed, and could not give their returns; but they were well satisfied with their crops of all kinds. The Rev. Mr. Brick, of the Episcopal Mission, was already using bread, when I was there, made from wheat of the present year's growth.

The only settler in all the Peace River country who lives beyond the immediate valley of the river (Mr. Milton, who lives about eleven miles from Dunvegan), lost all his crop by the frosts; fortunately for him, his operations were not very extensive. A company was formed last season, by people interested in that part of the country, to erect a small grist mill, in order to encourage settlement there; but the unusual severity of the season caused them to recall the order they had already sent out for the mill. It is much to be hoped that next season will prove more favorable; should it not, it will divert a good deal of attention that is now directed to that part of the country, and of which (aside from the climatic conditions) it is in every way worthy.

I was informed that in the season of 1883, on Great Slave Lake, the Hudson Bay Company caught and used 75,000 whitefish. There are also many other varieties of fish in those lakes. Trout are often caught weighing upwards of 40 pounds and on the Mackenzie, a very large species of salmon is plentiful, which is said to weigh as much as 100 pounds.

The 75,000 whitefish mentioned, would average about 2½ pounds each, and represent about 200,000 pounds of good palatable food.

With proper care the fish of those lakes could be made a source of wealth to that part of the country, and food for the more agricultural portions in the south. Add to this the future value of the vast forests, and the probability that the immense deposits of bitumen (or whatever it may prove to be) will be converted to a useful purpose, and the prospect of mineral wealth being discovered in the vast Laurentian district north of Lake Athabasca, and the future of this part of the country may not be so dull and valueless as many think it doomed to be.

SENATE COMMITTEE ROOM,

OTTAWA, 25th April, 1888.

GEORGE M. DAWSON, M.D., LL.D., Assistant Director of the Geological Survey of Canada, called and examined.

By the Chairman :

Q. Can you give us any information as to the possibility of navigating, with suitably constructed craft, the waters of the Arctic Sea, between Behring's Straits and the mouth of the Mackenzie? A. I have stated what I know in short form in my written replies to the printed questions. I have no personal experience of the northern coast or of the mouth of the Mackenzie. All I have been able to gather has been based on reading works on the subject and also from conversing with men who have been up there whaling. It seems quite practicable to get as far as Point Barrow every year, and to return through the Straits, but a vessel getting much beyond Point Barrow is apt to be closed in by the ice and may not be able to get back the same year. The Arctic search expedition vessels under McClure and Collinson both went in that way and made their way through the ice to a point east of the mouth of the Mackenzie. One of them wintered in Princess Royal Straits, and another in Banks Strait, if I remember correctly. They were both, however, over 15° east of the mouth of the Mackenzie, and both Collinson and McClure speak of the influence of the Mackenzie River in producing a wider strip of "land water" opposite the mouth of the river. I have quoted in my reply to question No. 5, the temperature observations that one of the vessels made, showing the great rise in the sea surface temperature when opposite the mouth of the Mackenzie. All these

expeditions that I have referred to were made in sailing vessels and consequently under disadvantages as compared with what might be done now with steamers. The great weight of this ice causing it to ground a long distance from the shore on this shelving coast produces this channel or "land water" which is mentioned. You can imagine the difficulty of beating up there with a sailing vessel. It would be a slow and tedious operation compared with taking a steamer up the same narrow channel.

Q. I suppose a steamer starting with an avowed object, such as reaching the Mackenzie and ascending it and getting back again to a certain place, is very different from whalers and sealers, whose mission is to stop and catch whales and seals wherever they meet them? A. Certainly, and besides that one of the main objects of these vessels is naturally to keep out of the pack, because they want to be free to move about, and having no definite purpose in getting into narrow waters, they keep out of them generally.

By Honorable Mr. McInnes (B.C.) :

Q. How far is the mouth of the Mackenzie east of the point to which you say there is no difficulty in getting? A. About 500 miles.

Q. About two days' steaming with a good vessel? A. Yes, and probably it would take ten days or longer to go that distance with a sailing vessel in those waters.

Q. Do you know anything about the expedition of the "Plover"? A. If I remember right, Capt. Pullen accompanied the store vessel "Plover," which was sent to support the Franklin expedition. This vessel wintered several years at Point Barrow for the purpose of making a base of supplies. Capt. Pullen left the store vessel in 1849, followed the shore with two whale boats, and ascended the Mackenzie.

Q. Did he return the same year? A. I believe he continued his journeys up the Mackenzie, and returned to England by York Factory and Hudson Bay.

By Honorable Mr. Macdonald (B.C.) :

Q. Do you think the best route to the Mackenzie country will always be by rail to Peace River, and by water down the Peace River and other rivers and lakes? Would it not be a more feasible route than water communication will ever be, on account of the ice in the Arctic Sea? A. I have stated in my reply to Question No. 59, that I believe it would be a very expensive route to bring such heavy products as whale oil, &c., up the Mackenzie, but I may be wrong in this. Of course, on these subjects, I speak without personal knowledge of the Lower Mackenzie and the Arctic Sea; my personal knowledge is confined to the Peace River and the upper waters of the Liard.

Q. I presume that a whaling ship would carry its own catch away by Behring's Sea, and the sealers as well? A. Yes. The idea which I ventured to suggest was, that whaling stations be established east of the region usually reached by whalers, which would enable whaling and sealing to be carried on in a way that it could not be by vessels going and returning the same season, and remaining to catch whales and seals in those northern waters.

By the Chairman :

Q. Still, you think it is possible to reach the Mackenzie River, and if the water is not too shallow to ascend that river with a sea-going steamer of suitable power? A. Yes; I think it is quite possible to reach the mouth of the Mackenzie. It remains only to ascertain whether it will pay. There will be a great addition next year to our knowledge of that region, because Mr. McConnell, who assisted me on the Yukon, is wintering this winter at Fort Providence, and will go down the Mackenzie this spring, and Mr. W. Ogilvy is coming across from the Porcupine River to the mouth of the Mackenzie and carrying a survey up the Mackenzie.

Q. Where is he this winter? A. He is wintering on the Yukon, near the intersection of the river by the 141st meridian. I had a letter from Mr. McConnell the other day. He was then at Fort Rae, on an arm of the Great Slave Lake. I have a short preliminary report of his here which I thought you might wish to see. I left him at the forks of the Dease and Liard last June, and he descended the Liard River

as far as the Mackenzie and is wintering at Fort Providence, which is situated at the lower end of Great Slave Lake.

Q. That is some distance above Fort Simpson? A. Yes; up the river, south of Fort Simpson. He gives a good idea of the character of the lower part of the Liard River in part of his report, which I may read:—

"I left the mouth of Dease River the day after you did, after inducing two Indians to accompany us as far as the Devil's Portage, but they were scared back at the first ripple we came to, and we saw them no more; and had, like you, to fight our way without any local assistance. We had to work hard, and keep a sharp lookout ahead, and make numerous portages, but otherwise experienced little difficulty and got down without the slightest accident of any kind. I steered the boat myself down all the worst parts of the river, I am afraid sometimes rather to the detriment of the traverse, but it was unavoidable, as whenever the men had the management of the boat they invariably disagreed as to the proper channel to take, a dangerous proceeding in the middle of a rapid. They however worked well on the portages and I was well satisfied with them. I was agreeably surprised to find the Devil's Portage only four miles long instead of twelve as reported, but as it passes over a mountain about 1,000 feet high and was all overgrown, we decided that it would take too long to open a passage and drag our boat across as we had done on the previous shorter portages, and determined on abandoning it and rigging up the canvas one. It was well that we did so as the succeeding forty miles turned out to be the worst part of the river, and consists of a simple succession of rapids and short canons filled with dangerous whirlpools and in many places is utterly impassable at high water for a small boat of any kind. We had, of course, to make numerous short portages, and in one case one of four miles, but as we had only the light canvas boat to pack, we got through without difficulty and in ten days reached smooth water below all the rapids. Two days afterwards, and exactly a month after leaving Dease River and about the same time that you reached Pelly Banks we met the Hudson's Bay Company's outfit on their way to Dease Lake, near the mouth of the Nelson. From them we learnt that provisions were very scarce in the Mackenzie River district, that at Fort Liard they were starving and at Fort Simpson were living on half rations, and I decided on sending my men back at once, while they still had sufficient supplies to get out. * * * * *

I have since heard by Lepine who brought me your note that with the exception of upsetting their boat once they got up all right. After leaving the men I got an Indian to steer me down the river, but he left me when he came to his camp and I floated down the rest of the way to Fort Liard, along at Fort Liard I waited a few days until I got an Indian and a bark canoe and came on then to Fort Simpson. *

To put in the fall I went up to Fort Smith by the steamer and from there came down Slave River with a couple of Indians as far as Salt River, ascended it to the Salt Springs, and then came on down Slave River to the lake, coasted along the southern side as far as Hay River, ascended it to the falls and then passed round the western and northern side of the lake as far as some tar springs which were reported to exist there, and which I found all right and then back to Providence. It is almost impossible to do any satisfactory winter work here owing to the intense cold, and it is a difficult matter to get dogs, and still harder to get supplies for them, but I intend if possible to make a few trips out in different directions, more for the sake of getting a general idea of the character of country away from the river, than for surveying purposes. * * * * *

The position of the Liard as shown on the map is greatly out, it does not run nearly so far south as shown, and the mouth of the Nelson is fully seventy-five miles east of its true position.

Q. You think the Liard River is navigable from Fort Liard to Fort Simpson? A. Yes, I think so.

Q. That is for stern wheel steamers? A. Yes; I refer to stern wheelers for all those western rivers.

Q. You give us incidentally a description of the fish in that region. I may say it is still a disputed point as to whether there are salmon in the Mackenzie or not. Two witnesses who came from that country say there are salmon there, and two others who have the same opportunities for observation say that while there is a fish which ascends as far as the obstruction at Fort Smith which is called the *inconnu* and is an excellent fish is not the true salmon; can you tell us anything about this? A. I have always understood there is no true salmon on the Mackenzie, but as I have never been on the lower part of the river I would not care to express a definite opinion on it. I have seen no mention of salmon in the scientific report, such as Richardson's, on the river, though he speaks constantly of the *inconnu*.

Q. What is your impression, derived from what he and other authorities say concerning that fish: is it likely to be a valuable one? A. Yes, I should think so. He speaks of it as being a very good fish. In all those waters tributary to the Mackenzie the Arctic grayling, or Back's grayling, which is an excellent fish, is to be found.

Q. Will you give us a description of it? A. It is a fish resembling the trout in appearance and size, but has a very large back fin. It is a game fish, very like the trout, takes the fly and is excellent eating. That fish I found in the headwaters of the Mackenzie, as far up as the very source of the Peace River, and also of the Liard River, and it also occurs to the headwaters of the Yukon, which, of course runs into Behring's Sea.

Q. Is it a purely fresh water fish? A. Yes.

Q. About what size? A. About the size of the ordinary trout. I suppose a 2-lb. fish would be a fair sized one.

Q. In another part of your evidence you give us the length of navigable rivers. I did not notice whether you gave us the breaks in the navigation or not, but I would like to ask you just three questions in relation to that. There is a break in the navigation of the Great Slave River above Fort Smith. What is the length of the road around that? A. I have no personal knowledge of that part of the river, and my answer to that question would probably be only repeating what some one has said before.

Q. Have you a knowledge of the Athabasca River? A. I know the Athabasca River from Athabasca Landing up, but not below that point. I have quoted in my reply previously, from Mr. Ogilvy's report, which gives accurate measurements.

Q. In the navigation of the Athabasca above the Landing a steamer is now being built, and expects to have a navigation of 170 miles: that is, they expect to go down and then up through the Lesser Slave Lake River into Lesser Slave Lake and up to the head of that lake. Can you tell us whether that is likely to be correct or not? A. I think there is no doubt the steamer can go up the Athabasca to the mouth of the MacLeod River. I formed that opinion in coming down the river in a canoe, that is 170 miles above the Landing. With regard to the Lesser Slave Lake River, I am uncertain. I was up it and down it in a canvas boat, and I should certainly have said that 18 miles of the lower part is hardly passable for a steamer, but I have no doubt, if they are building a steamer, that they have ascertained that it is navigable. It is full of rapids and rather shallow, but it is possible that it can be navigated. With regard to routes for reaching the Mackenzie, I have made rough estimates of distances. I have marked in blue lines on the map the routes that I refer to as being the best we know of leading into that country from the west coast and from the Saskatchewan region.

Q. What is the extent of the navigable waters on the Yukon, in British territory? A. At least 1,000 miles.

Q. Navigable for what class of craft? A. Stern wheel steamers of light draft. All those rivers are rapid and shallow. I say at least 1,000 miles, because in all cases, except one on the Lewis River, I have stopped my measurement at the first break in the navigation, and there are no doubt long stretches above that which are navigable.

Q. Are we to understand that this is continuous navigation? A. Not in any one direction, but including the navigable portions of various branches.

Q. Are there any breaks in the navigation? A. Only one on the Lewis River. I have included the Lewis above the break, because it forms part of a travelled route.

Q. Do you understand that it is the wish of the Committee that in regard to the arable and pastoral lands, and in regard to the tree limit and the extent of the barren grounds we want as much on that information as you care to put on one of those maps? On another we want the minerals, on another the navigation, and on the one which gives the navigation put the projected railways? A. Yes. They will have of course to be put down in a very general way on a map drawn on such a small scale as this. I have no doubt that barley can be ripened as far north as Fort Selkirk, at the mouth of the Pelly and Lewis Rivers, tributaries of the Yukon. It is a little difficult to separate the basin of the Mackenzie from the waters of the Yukon when you get west of the mountains, because these rivers interlock with each other in all directions. The only attention that has been paid to this country so far, is by miners in search of gold. In passing through the country last summer I formed the opinion that a large portion of that country will be eventually settled. The northern boundary of British Columbia is at latitude 60.

By Honorable Mr. Macdonald (B.C.):

Q. I suppose it will be a grazing country? A. It is chiefly a wooded country, but there are open tracts of land along the river banks. I think this area which I have marked on the map, and which includes about 60,000 square miles, is the better part of that country north of British Columbia. The northern part of British Columbia itself, is largely a mountainous country but dips down to lower ground to the north, and consequently you get a more favorable climate and larger cultivable areas.

By Honorable Mr. McInnes (B. C.):

Q. In that 60,000 square miles is there much arable land? What is the character of the country? A. The country is generally wooded. In a general way you would speak of it as a mountainous country, but there are large areas of flat land and rolling land. It is not a mountainous country like that along the coast of British Columbia or the Rocky Mountain region.

Q. Are the valleys much larger? A. There are large tracts of land which are low or undulating as well as wide river valleys.

Q. And in your opinion it is a good grazing country? A. I would scarcely wish to represent it as a good grazing country. I think it is a country where animals may be kept, but it is certainly a country where you could raise barley, rye and other hardy crops, and which though it may not produce a large quantity of grain to export, will produce what is required in the country and in that way will assist in the development of mining and other industries. It ought eventually to be able to export such things as are exported from the north of Russia—flax, hemp, resin, timber and possibly also barley and cereals to some extent.

Q. In that area of 60,000 square miles, how much grazing land is there and how much is fit for the cultivation of barley and other hardy cereals? A. It would be difficult for me to give any precise statement. I have travelled merely round by the Stikkeen River, Dease River, Liard River, Pelly River, Lewis River and the Chilkoot Portage, so that while having a general idea of the country it is impossible to give anything like precise areas, but I should think that a very large part of that country will eventually be cultivated. I do not think that we ought to consider a country which is beyond the limit of the growth of wheat is a useless country at all. In fact we know that in Russia some of the provinces north of the northern limits of wheat are rich and comparatively largely populated districts, and in the course of time our country which is in a similar position will be populated in the same way. I may mention that wheat has been occasionally grown and barley habitually grown at Telegraph Creek on the Stikkeen River in latitude 58.

By the Chairman:

Q. I notice that the upper waters of the Liard are included in that area? A. Yes; the headwaters of the Liard River.

Q. We have no information about the gold on the upper waters of the Liard as yet? A. Dease Lake, which is the source of the Dease River, one of the main tributaries of the Liard is the centre of the Cassiar gold mining district of British Columbia, which is pretty well known, and has been reached from the coast, although the waters flow into the Mackenzie. A small steamer was built there during the gold mining excitement.

Q. What is the length of the lake? A. It is 28 miles. The river below can scarcely be considered navigable for steamers. It is used by scows and boats.

Q. Have the Hudson Bay Co. a fort there? A. They have no posts there now. They abandoned their posts in this country many years ago, but private traders carry on trade there, and the Hudson Bay last year were speaking of purchasing the rights of those men.

Q. What is the temperature of the country included in the area of 60,000 square miles on the headwaters of the Yukon and Liard Rivers of which you have spoken? A. The summer temperature is very pleasant, and I believe favorable to the growth of such hardy cereals as I speak of. There are, of course, to be found in that latitude, summer frosts, but liability to such frosts would not prevent the growth of barley and hardy grains.

Q. Wheat has been grown at Fort Simpson, which is on the latitude of about the centre of the territory enclosed in these lines on the map; why have you excluded it from the possibility of being grown in that territory west of the Rocky Mountains? A. Merely because it has never been tried, and I wish to be moderate in my statements as to the capability of the country. I call it a barley growing country, but I think in parts of it wheat might be grown. Professor Macoun reminds me that I might mention the plants which I collected there last summer and which he considers as being indicative of a climate that would be suitable for the growth of the crops which I have mentioned, and as a general index of the climate of the country. I have no list here, but Professor Macoun has and can speak on that point. With regard to the gold on the Liard River which is a tributary of the Mackenzie, I may state further that remunerative bars have been worked east of the country shown on this map and a long way down towards the Mackenzie. The whole appearance of this country leads to the belief that important mineral deposits will be found in it, besides those placer mines. There are large quantities of quartz ledges along the rivers in many places on the Liard River, half the river gravel is composed of quartz and the whole country is full of quartz veins, some of which are likely to yield valuable minerals.

By Honorable Mr. McLane:

Q. Is it gold bearing quartz? A. Yes, because we find gold in the bars though not so far as I have observed in the loose quartz. In fact the whole country at the headwaters of the Liard and running across to the Yukon, forms part of the metalliferous belt which runs from Mexico to Alaska and includes a great area of that country which is as likely to be rich in minerals as any portion of that metalliferous belt. We should remember that in British Columbia and on the headwaters of the Yukon we have from 1,200 to 1,300 miles of that metalliferous belt of the west coast. This is almost precisely the same length of that belt contained in the United States, and I think there is every reason to believe that eventually it will be found susceptible of an equal development from a mining point of view. From circumstances to which I need not refer now, it has so far been more developed in the United States than on this side of the line.

By the Chairman:

Q. What is the average width of that belt of twelve or thirteen hundred miles? A. About 400 miles on an average. Fort Selkirk or the ruins of Fort Selkirk at the mouth of the Lewis River, which is one of the main branches of the Yukon, is about 1,000 miles due north of Victoria, without taking into account 10° degrees of longitude which it is west, but it gives an idea of the depth of the country which is worth remarking. You find a country here 1,000 miles north of Victoria, or the 49th parallel, in which there is no doubt you can still grow barley and hardy cereals,

a distance as nearly as possible identical with the whole width of the United States on the Pacific coast from the 49th parallel to Mexico, yet at Fort Selkirk we are still 750 or 800 miles from the Arctic Ocean—nearly twice as far from the Arctic Ocean as we are here in Ottawa from James' Bay.

Q. You have stated the auriferous area in British Columbia to be 1,300 miles in length and its width, say 400 miles. That would make a square area of 520,000 miles. Is that what the Committee are to understand? A. I would prefer to say the metalliferous region rather than auriferous area because that might give a wrong impression.

Q. Is that a rough estimate—520,000 square miles? A. That will express the area of the metalliferous belt in a general way and may be taken as a minimum figure. This Yukon country was first prospected in 1880 by miners who came across by this Chilkoot Pass. Since then a yearly increasing number of miners has been going in. In 1887, this last summer, there were about 250 men, nearly 100 of whom are wintering at Forty-Mile Creek, near the international boundary. Mr. Ogilvie is near the same place with the object of fixing approximately the point at which the boundary crosses this river. The gold which was taken out of that country last summer, not counting the Cassiar country to the south, but merely the Yukon district, was estimated by those miners at \$70,000, but that is a very rough estimate indeed, because there is no way of checking it except by allowing so much per man on the average. There is an almost unprecedented length of river bars from which gold is obtained in that country. I have not tried to estimate it, but here and there on nearly all those rivers gold is found in paying quantities. The gold bearing river bars must be reckoned in the aggregate by thousands of miles in length.

Q. All those rivers, meaning the Yukon and its branches and the Liard and its branches? A. Yes.

Q. Can you tell us anything of the river that flows parallel to the Mackenzie that enters into the Mackenzie just at its estuary? A. That is the Peel River. All that I know of it is contained in a paper which was printed in 1845 in the Royal Geographical Society's Proceedings by Mr. Isbester, then in the Hudson Bay Company's employ. He describes it at some length.

Q. The steamer "Wrigley" runs up that river to Fort Macpherson; do you know if the upper part is auriferous? It seems to rise near the sources of the Yukon? A. I do not know. It has not been prospected. Mr. Isbester shows it in his map as rising from a number of small streams in the mountains. Reverting again to the question of climate: It is said that the Chinese, who are a very practical agricultural people, state the agricultural capability of a country by the length of the day, counting the hours of sunlight. The greater length of the summer days largely explains the exuberance of the vegetation in those northern countries. I have a few notes here worth considering while we are dealing with the question of this northern country, particularly the Yukon. I looked up the circumstances of the northern provinces of Russia and I found, taking the Province of Russia which seemed to compare most nearly with that shown on this map, both in its relation in Russia to the Atlantic corresponding to the relation of this country with the Pacific and in its latitude—that is the Province of Vologda. That Province has a total area of 155,498 square miles and it is chiefly drained to the north, like the country shown here. It lies between latitude 58 and 65. It is about 750 miles in greatest length and 300 miles greatest width. It is drained by the Dwina River chiefly. Its products are carried by this river to Archangel and exported thence in vessels by the White Sea in the same way that we hope this northern country of ours may be served by the Mackenzie and the Arctic Sea. The mouth of the Dwina is in latitude 65°, only a little south of the latitude of the mouth of the Mackenzie. The climate of the two countries is very similar. The winters are severe and the summers warm. There is no very heavy rainfall, such as we find near the western coasts bordering on the Atlantic, and on the Pacific. The exports from that Province of Vologda are oats, rye, barley, hemp, flax and pulse. The mineral products are salt, copper, iron and marble. Horses and cattle are reared; and the skins of various wild animals, pitch

and tar-pentine are exported. This Province supports a population of 1,161,000 inhabitants.

By Honorable Mr. Macdonald (B.C.):

Q. Is that Province in Siberia? A. No, it is in Russia proper. Now we have areas to the north which may make several provinces like Vologda, and for the purposes of illustrating this point I have made a very rough calculation here which as it is founded largely on suppositions, is perhaps scarcely worthy of being presented to the Committee, but may serve to give an idea. With reference to the agricultural area of Peace River I confine myself to a tract roughly marked on the map as to which I have some personal knowledge. Without going over what I have already written in reply to that question and which is largely embodied in a report published some years ago, I may say that the area which is included within the red lines, being only the upper portion of the Peace River country, is about 31,500 square miles. The proportion which I estimated as arable land is 23,500 miles. That would give 34,000 quarter-sections if it were sub-divided; reckoning a family of five persons on each, that area would be capable of supporting a population of 470,000, or in round figures say 500,000. I do not think it would be at all beyond the mark (though I am speaking now from the reports of others, because I have not been further down the Peace River myself), to assume that there is another area at least equally great of arable land in the Mackenzie valley to the north of this. That will give another population of say 500,000. Now, if we take the headwaters of the Mackenzie and the Yukon west of the mountains, I think we will be well within the limits of probability if we say that we have there 30,000 square miles of that region which may be cultivated with advantage. This, on the same basis as before, would support a population of 600,000 persons, or a total of say 1,500,000 persons in the Mackenzie valley, and adjacent tracts to the north altogether of the Saskatchewan watershed, and on the west of the mountains, north of British Columbia. I think we might, without exaggeration, to include miners, fur traders, hunters, lumbermen and those engaged in transport of trade, besides those in outlying fertile sections not included in this—double the total just arrived at. This will give us a population of 3,000,000 people in that part of the Dominion alone. As I am not personally familiar with the Lower Mackenzie region east of the mountains, I may have underestimated its value, but I may say that the conclusion I formed after examining the country west of the mountains was that that part of it and the north of latitude 60° is of greater economic value than all the remaining northern portion of the continent in the same latitudes.

By Honorable Mr. McInnes (B.C.):

Q. That is in the Yukon district? A. All west of the Rocky Mountains and north of British Columbia. If you compare the east with the west the difference becomes very marked. The latitude of Fort Selkirk, which is at the mouth of the Lewis River is that of Hudson's Straits. At Fort Selkirk you have a beautiful country, though in winter it is, no doubt, very cold. You find there plenty of timber, the spruce attaining a diameter of two feet or more and being tall and straight. You find grassy hill sides and vegetation very much like that of regions much farther south. At Hudson's Straits, on the contrary, you find barren rocks without a stick of timber and with the ice lying on the shores, in greater or less quantity all the year. In the west we have a valuable country far to the north. Even from a climatic point of view and without taking into account its mineral wealth.

By the Chairman:

Q. Can you give us information as to any possible value the barren grounds may have in future. Bishop Clut told us a few days ago that he had heard a report of a gold mine being in some part of it. He said he had not seen the specimens and therefore had not heard enough to judge whether it was the case or not. I notice in the valuable geological map which you have published in the annual report of the Geological Survey for 1886, that you indicate geologically from the polar expeditions and other sources of information what you know of the rocks of the region. From that same source can you give any suggestion as to any possible use that country may be in the future. For instance the Coppermine River runs through what is described as

the barren grounds, and you state that not only is pure copper found there, but copper in various other conditions is found along that river. I think you mention in some place or other that there are mineral indications on Back's Great Fish River. In that country, taking into consideration the possibility of minerals, or any other sources of wealth, may the Dominion expect to find anything valuable? A. Referring to the Coppermine River particularly there is every reason to believe there is a repetition along that river and in its vicinity of those rocks which contain copper on Lake Superior and which have proved so rich there. If there were any way of getting the copper out from that country, as there will no doubt eventually be, it could be examined and prospected and worked at once. At the present time it seems to be beyond the reach of the prospector. The Hudson Bay Co. sent Hearne up there in the latter part of the last century to discover where the copper found in the hands of the natives come from, but he could do nothing but report that he found copper there. The sea to the north was ice-bound and he did not see his way to utilizing it so, so it has remained ever since. With respect to the barren grounds, I know nothing personally. I think we really know very little about them yet. It would appear that the barren grounds have been generally characterized on the result of a very few expeditions which have not gone over them at all extensively. Sir John Richardson wrote of the barren grounds, but his experience was confined to the parts between the Coppermine River and Great Bear Lake which is a very small part. Hearne traversed more of the barren grounds than anyone else, but his book was published about the close of last century and he was not a scientific explorer. He travelled with the Indians in winter under circumstances of great hardship and starvation and I believe we have not got sufficient information yet about these "barren grounds." He speaks of the abundance of fish in the rivers and lakes, and there is no doubt abundance of musk ox and reindeer there. What mineral discoveries may be made there, it is, of course, impossible to say.

Q. Is it or is it not a fact that an immense district in the north-eastern portion of the continent, within the limits of our inquiry—that nearly half a million of square miles of country is, except along its watercourses, as utterly unknown as the interior of Africa? A. Yes. That is really the case. We have only got Hearne's ramble—we cannot call it a survey—for it is evident that his map is very much like that of the sources of the Nile previous to the explorations of the last thirty years.

To show the extent and value of the whaling industry in Behring Sea and in the Arctic Ocean to the north—entered through Behring Strait, which has always been considered an open route to everybody—I may give the following figures: In 1880 there were 36 sailing crafts and four steamers. They produced 35,000 pounds of whalebone, worth \$850,000; 15,000 pounds of ivory, worth \$9,000; 21,000 barrels of oil, worth \$280,000—a total value of \$1,139,000, an average of \$28,475 per vessel engaged. This is an extract from the United States tenth census.

By Honorable Mr. Kaulbach:

Q. These industries are chiefly carried on from San Francisco, are they not? A. Almost entirely from San Francisco.

By the Chairman:

Q. We would like to have similar information regarding the whale and seal fisheries of Hudson Bay, Fox Channel and the Gulf of Boothia, as far west of that as they penetrate? A. I have no personal experience of that region, but I might obtain the information. I may mention in connection with this region, as bearing on what I have already said respecting whaling stations for the coast near the Mackenzie, a fact probably known to the Committee, that there are several whaling stations in Cumberland Sound on Baffin's Bay, established by United States and Scotch fishermen, for which there is no authorization. These gentlemen import what they please, and trade with the Esquimaux as they please. I dare say Dr. Bell may have stated to you that the New Bedford whalers are in the habit of going into Hudson Bay to Marble Island and elsewhere, and staying there all winter trading with the Esquimaux. I think the fact that they are competing with the Hudson Bay Company in trade, and that they are selling whiskey to the natives has

been brought up in the House. While the Hudson Bay Company are obliged to pay duty on their importations into that district, these traders pay none, and our people are placed at a considerable disadvantage.

Q. While whalers and sealers from British Columbia are at a great disadvantage in Behring Sea in competing with the Americans, our neighbors come into Hudson Bay and not only catch our whales and seals, but establish permanent places for that purpose in our territory, and trade with the natives without paying duty on their imports? A. Exactly. They have trading places in the Hudson Bay country, notwithstanding the restrictions attempted to be applied in the case of Behring Sea. In Hudson Bay we have a sea which is entirely enclosed by our own country, and the entrance to which is comparatively narrow, but Behring Sea is entirely open, we may say, to the south. One opening is at least 65 miles in width, and it is not enclosed by the territory of any one country.

By Honorable Mr. Kaulbach :

Q. I suppose there is no place in Hudson Straits where the distance between the islands would be more than 20 miles at the outside? A. Water less than 30 miles in width must be traversed in order to enter the bay.

Q. How wide is the entrance to Behring's Sea—about 800 miles, is it not? A. It would be more than that across, but the widest opening between the islands is about 65 miles, and this is only one of a great number of openings among a fringe of small islands. A vessel might sail in there without sighting land unless it was a very clear day. The only contention that the Russians ever set up concerning Behring Sea, when they attempted to defend their ukase, was that they owned the land on both sides of the sea; but now that they have sold Alaska, the only possible claim to sovereignty is gone.

The Committee adjourned until to-morrow.

GEOLOGICAL SURVEY, OTTAWA, 11th May, 1888.

DEAR DR. SCHULTZ,—Since my examination before your Committee on Mackenzie Basin, I have endeavored to obtain more information respecting the navigation of the Arctic between Behring Strait and mouth of Mackenzie. I have not been able to find much, but beg to enclose the accompanying memorandum on the subject. If you wish to incorporate in the printed report a small map showing the limit of the pack ice at different times in that region, I shall endeavor to have one made in the office.

Yours very truly,

GEORGE M. DAWSON.

Memorandum.—The position of the southern edge of the pack ice in summer, between Behring Strait and the mouth of the Mackenzie, appears to be very variable, as a comparison of the accounts of different navigators show. The facts bearing on this subject are not so numerous as might be expected from the considerable number of whalers frequenting the region, owing to the circumstance that these vessels do not keep strict account of their position while cruising for whales.

The general information given on this point in the U. S. Directory for Behring Sea and the coast of Alaska, supplement No. 1, 1886, is as follows:—

"The ice pack seldom moves more than a few miles off shore between Icy Cape and Point Barrow, and is likely to close in at any time; a north-east wind, though it blows directly along the shore, keeps the ice clear and allows the current to set up past Point Barrow. The heavy ice, when close in shore, stops the surface current entirely and lowers the temperature to 36 deg. or less, so that a vessel working up this shore may readily tell if the ice is on the point by watching the set of the current and the temperature of the water. If the ice is clear of the shore the current

will be setting to the northward from one to three knots per hour, with a temperature of 40 deg."

That at such times there is a wide extent of open water off this coast, is rendered manifest from the incidental statement met with in the same publication, to the effect that the bark "James Allen" when some degrees east of Point Barrow, "stood north during thick weather, under easy sail, 80 or 100 miles."

The position of ice in Behring Sea in winter is best shown on map 81, U. S. Coast Survey Report, 1880. In summer, on map accompanying Report on the cruise of U. S. Revenue Cutter "Corwin," 1881.

G. M. DAWSON.

OTTAWA, Thursday, 26th April, 1888.

The Committee met at 11 a.m.

The following letters were read:—

OTTAWA, 24th April, 1888.

Hon. Dr. SCHULTZ.

DEAR SIR,—While attending, on your kind invitation, the examination of Chief Factor Christie and Bishop Clut, I was much struck with their testimony as to the extent and value of economic resources even on our "barren grounds," especially as to the reindeer and, in scarcely less degree, the musk ox.

In relation to this subject I was not in a position to give any evidence, but from long familiarity with the subject, from the talk and epistolary correspondence of friends (chief officers and partners of the Hudson Bay Company) for many years in active life in and about that region and the whole Hudson Bay system, I have a very strong opinion as to such value and further as to its availability.

From one of these correspondents to myself, so lately as 1874, namely, the late Chief Factor James Anderson, (b) N. B., not the Chief Factor James Anderson, designated (a) in the Hudson Bay, Company's books, father of the Mr. Anderson examined before your Committee. I have the idea that the "Lapps" of northern Norway would find our "barren grounds," especially on the borders of the forests and even of the sea, not only a fit, but to them in their comparatively greater difficulties of life, a better habitat.

The enclosed slip of newspaper headed "In Far Lofoden" gives a fair view of the sea capital of these interesting (Icelandic) people. I have a letter from my friend Anderson—among those laid before the Committee—describing his visit *via* Stockholm and the Gulf of Bothnia to and at their mainland capital "Quickjock" in Lapland, some 70 miles inside the Arctic circle, as he states.

As we all know they domesticate reindeer or at least control and utilize them in their own peculiar nomadic way. As to the musk ox, I know of no reason why they may not be likewise.

As to transport to our grounds there should be no difficulty. From Tromsøe (Northern Norway) to Fort Churchill is just a step across (easy sail). From Fort Churchill, inland, would with proper guardianship from the Government, with or without the aid of the Hudson Bay Company, I think be quite practicable.

I merely throw out the suggestion for you to use as you may think proper.

Ever, with thanks, at your command in this matter,

I am yours sincerely,

M. MacLEOD.

IN FAR LOFODEN.

STRANGE SIGHTS IN REMOTE NORWAY—THE REAL LAPLANDER.

Consul General Anderson recently wrote an account of a journey made by him to Lofoden Islands in the far north of Norway. Proceeding northward, he said, we soon reached the object of our journey, the Lofoden Isles, a close, continuous, mountainous group extending from the sea in a north-easterly direction until they reached the coast, about 150 miles north of the Arctic circle. As we approach the islands in the winter season the scene is a most animated one. Everywhere the small, open, yet wonderfully strong and steady boats of the fishermen are seen scudding along, with their small square sails bulged by a stiff breeze often miles from land, or, being at work, they lie tossing upon the waves like ducks, their crews of from two to eight men being busy casting and drawing their hand lines, or planting or raising their trimmers and nets.

The most important town north of Throndhjen is Tromsø, a city of about 6,000 inhabitants, situated on an island of the same name. Here we find a so-called Latin school, a teachers' seminary, an ethnographical museum of natural history. It is an important shipping port for the products of the Lofoden Islands and its chief exports are dried cod, salt herring, spawn (which is used as bait in the French and Spanish sardine fisheries), some skins, furs and train oil.

Not far from the city is a camp of Lapps, or aborigines as they might be called, they being no doubt the descendants of the first race of people who had inhabited the Scandinavian Peninsula, and who were driven into their present northern quarters by the Teutons, who gradually took possession of their country. There are at present about 18,000 Lapps in Norway, of which the greater number are fixed or settled, while about 2,000 still maintain nomadic life with their herds of reindeer. Locally there is a distinction made between the fixed or fishing Lapps and the nomadic, but there is no real difference between them, save such as would unavoidably arise from their different modes of life. Originally they were one race and class, but as the reindeer constitutes the only wealth of the Lapp, and supplies his daily wants, the poor families were obliged to turn to fishing and fixed abodes, where they still live in all the squalor and primitiveness of their fathers, occupying dirt or turf huts, dressing in skins, cooking their food over open fires, and sleeping on furs or blankets. As a race they are not unlike our Indians, though they are smaller and even less intelligent; but they are as great lovers of strong drink as our own redskins, and after a visit of travellers to their camp, who buy the Lapp articles they offer for sale, the whole company of men, women and children are frequently seen drunk on the streets in Tromsø.

A great source of surprise to the traveller here is the comparative richness of the vegetation. On the journey from Throndhjen to Tromsø we noticed the dwarfed trees and the absence of forests, while here, 70 degrees north latitude, far north of the line of Iceland and Central Alaska, we find bright, waving forests of well grown ash, birch and pine. Indeed, the luxuriance of the birch forests in the vicinity of Tromsø is most remarkable. Other vegetation is also well developed, and as we stand on the borders of a small lake, from which the town of Tromsø is supplied with water, looking over its surface with the woodlands on the opposite banks, the bright waters of the fjord seen through the openings, and the snow-capped cliffs and headlands in the background, we have a view which all the romantic beauties of Tyrol, Switzerland and Italy cannot surpass. Imagine it in summer, illuminated by the midnight sun!

The following extract was sent by Warden Bedson, Stony Mountain, Man.:—

"The skin of a half-breed buffalo, which is on exhibition at Geo. H. Rogers' fur store (Winnipeg), is an object of much interest to passers-by. The skin was taken from an animal raised by Warden Bedson, and is a very large one. The color of the

fur is not as uniform in color as that of the thoroughbred buffalo, but it is of a finer texture. The skin is also finer grained than the skin of the thoroughbred, and farmers say that the half-breed skin, excepting in the matter of color, is a superior article."

NOTES ON THE REGION OF ISLE A LA CROSSE, BY L. F. LAFLECHE,
BISHOP OF THREE RIVERS, P. Q.

I lived at Fort Isle à la Crosse for two years and nine months, from the 8th September, 1846 to the 5th June, 1849. During that time I traversed this region within a radius of thirty leagues, and following are my impressions which I retained :

1st.—The Territory :—This territory is in general sandy, low and marshy, and covered with a great number of little lakes of which the largest are these: Isle à la Crosse, Des Oeufs, Du Bœuf, and Du Serpent. It is furrowed by small rivers which communicate with the lakes. Most of these watercourses cannot be of any use for navigation if we except the English River, which is the great artery of all that region to Hudson Bay, Beaver River, one of its principal affluents, and the River of Lake la Rouge. These watercourses are broken by numerous rapids and some falls of some elevation, and covered with ice for seven or eight months of the year. In the autumn of 1848 ice formed on Lake Isle à la Crosse the first of November, and did not break up until the 5th June following.

The country is flat and without mountains: one sees nothing there but a few hills of slight elevation.

The vegetation has a poor appearance and can offer no great advantages for the working of the forests. Autumn fires have devastated them considerably. The principal species of wood are the cypress which hardly attains a diameter of a foot and a half at the butt, the spruce, white and red, the birch, the poplar and some fruit trees of small importance, such as the small wild cherry, the saskatoon, which the savages use to improve their pemmican. The pine, the oak and other large forest trees are there entirely absent. I did not remark there nor did the Indians, any rich minerals such as are found in the basin of the Mackenzie River.

2nd.—The Climate:—The territory of that region does not evidently offer any important advantage for agricultural work, but if it were naturally as fertile as that of Manitoba it would be impossible to cultivate the cereals there with success, because of the rigor of its climate and the length of its winters, which last in the neighborhood of six months, and also untimely frosts which come to destroy the crops in the month of August and September. It was thus I lost my little field of potatoes in 1847 by a frost which came on the 25th August. Notwithstanding all these obstacles we tried to ripen wheat there sometimes, and cultivated with some success barley and oats. Garden vegetables could also be tried there. The most certain wealth of that country will be found in the fur trade, which the Hudson Bay Company has always carried on with great profit to the present time, and the fish, the whitefish in particular, offer the most certain guarantee of support.

The half-breeds and the Indians love to gather about the mission where they built a house, and cultivate a small field to assure to their families a living during their hunting expeditions.

The greatest cold which I observed at Isle à la Crosse was 32 degrees below (Reaumer), 40 Fahrenheit. What renders the climate intolerable is above all the constant cold and the length of the winter. During the three winters that I passed there the thermometer fell 25 degrees below zero (Reaumer) towards the beginning of December, and remained there until the commencement of February. This intense cold, lasting so long, becomes exceedingly tiresome. I have remarked that at the time of the greatest cold, when the thermometer fell to 32 degrees below (Reaumer) people ordinarily appeared at church with frostbites on their faces, indicating that at that temperature the skin of the human face resists frosts with difficulty.

Such are some of the recollections which remain with me concerning the territory and the climate of that region, which I have not visited since 1849. I am unable to say anything concerning the country since I have been absent from it. I will be happy if I can be of any use to you. You will find a source of precious information in the journals kept by order of the Hudson Bay Company at the several trading posts in which are entered from day to day everything there which might be found interesting to be transmitted for the history of the country.

L. F., BISHOP OF THREE RIVERS.

THREE RIVERS, 3rd April, 1888.

Professor MACOUN reappears and his examination is continued as follows:

By the Chairman:

24th Question:—A. That is already indicated on maps which have been submitted.

25th Question:—A. A careful examination of the printed reports and others in manuscript of the various travellers who have passed across this—Franklin, Back, Anderson and Dease—lead me to believe that the following notes will be about an accurate description. The western part of the barren grounds along the Coppermine River is a country of small lakes and low hills, with a fringe of wood bordering the rivers or stream margins, and in some of the hollows. It seems that owing to the intensity of the frost, the rock is being rapidly decomposed, and this, together with the shortness of the season of growth, prevents the vegetation making a good start. From Anderson's journal I infer the country is of the same character along Back's Great Fish River. No wood except willows or dwarf birch seems to have been seen on the greater part of this river, and dwarf birch and willow are constantly referred to in the narratives of Franklin and Back, showing that these shrubs, although only growing to the height of a foot or two, are the diminutive trees of that region. As we approach Hudson Bay, peaty soil gives place in many parts of the country to the bare rock, and by the shores of the bay this surface is more or less covered with a peaty stratum akin to that of the peat bogs of Ireland. It will thus be seen that it is a very difficult matter to give a fixed line for the limit of timber and of the barren ground, as from all accounts the two are inextricably mixed up from latitude 60° to 67°. This is about the average line from east to west.

Q. Does any portion of the barren grounds resemble the Laurentian country north of this city? A. Yes, in this way: that the southern margin of the Laurentian region at Lake Athabasca consists of a series of rounded, glaciated hills, almost devoid of wood, with heavier timbered valleys between. Did fires traverse our Laurentian region for years in succession, these hill tops would be completely denuded of wood and shrubbery of all kinds, and were the atmosphere cold enough we would then have the counterpart of the southern part of the barren grounds.

Q. Is the geological character of the two countries similar? A. Yes, very largely; but this question can be better answered by asking a geologist—for instance Dr. Dawson, who is well informed on the subject.

Q. Is any portion of the vast region known as the barren grounds suitable for settlement? A. No, not by white men.

26th Question:—A. Barley and potatoes have been grown at Fort Norman at the mouth of Great Bear Lake River, about lat. 65°, and even at Fort Yukon, on the Arctic circle, barley is a sure crop. These are not particular points noted for their good soil, but located solely for the fur trade. Five-sixths of the country is just as good as these points, and will in future produce as good crops. There is no point east of the Mackenzie suitable for agriculture.

27th Question:—A. As far north as lat. 62°, at Fort Simpson.

Q. Is it a crop that can be depended upon every year? A. I was informed by Chief Factor Hardisty, brother to Senator Hardisty, who had charge of the Macken-

the River District for many years, that wheat was a sure crop at Fort Simpson four times out of five, but that the country around Fort Liard, on the Liard River, was much superior to Fort Simpson for agricultural purposes. All kinds of garden produce succeed well; and melons, after being started in a hot bed, ripen well.

28th Question:—A. While at Fort Vermillion, on Peace River, in lat. $58^{\circ} 24'$, I was informed by old Mr. Shaw, who had charge of that post for fifteen years, that Indian corn would ripen well every year there, and at Battle River corn ripened three years in succession, and that frost never injured anything on this part of the river. The whole country at Fort Vermillion is a plain, not elevated at its highest point more than a hundred feet over the river, but the greater part of it is less than fifty feet. The soil is wonderfully like that of the second prairie steppe, in the prairie region, as the surface is composed of black loam, mixed apparently with limestone gravel. From Vermillion the Caribou Mountains are visible about forty miles off. These may have the effect of keeping off the cold winds from Great Slave Lake, and hence the country is permanently warm. Both days and nights have been warm down on this part of the river, whereas on the upper parts, where high banks are, the cold was even felt at night in August.

29th Question:—A. The grain at Fort Vermillion was sown on the 8th and 20th of May, and was cut on the 6th of August. Wheat growing among the barley and by the fences was almost ripe August 12th, when I was there. At the Rocky Mountain Portage, where the Peace River issues from the Rocky Mountains, latitude 56° , we found a first rate garden with vegetables far advanced, July 21st; new potatoes, onions, and carrots were part of our bill of fare. That was in 1875. Five days later at St. John's vegetation even further advanced, and all kinds of garden stuff were in the greatest perfection. Nigger Dan's barley was coloring on the 26th July, and would be cut the first week in August. His potatoes were large, and enough for fourteen men were dug on the 2nd of August. I may mention that strawberries were fully ripe on the 6th July at Hudson Hope. At Dunvegan barley was almost fit to cut August 4th. Cabbage in the priest's garden were closing, and all his garden vegetables far advanced. At Battle River pease were getting ripe August 8th. At Vermillion potatoes were very large and many heads of barley contained sixty grains, others many more. I never saw such fine barley before. Barley sown on the 8th May and cut on 6th August—that is at latitude $58^{\circ} 24'$. At Red River they have no ploughs and the ground was broken up with a spade or hoe. The garden stuff was wonderfully luxuriant—pease, Windsor beans and potatoes far advanced; cucumbers started and raised in the open air, a very large crop, and a number of them ripe on the 14th August. At Fort Chippewyan Mission, two miles from the fort, wheat, oats and barley, a good crop as regards grain. Windsor beans were ripe and pulled up on the 17th August. Wheat and barley were in stook the 26th August, and specimens of these which I brought to Ottawa are here on the table. Barley ripens at Fort Simpson, latitude 62° , every year between the 12th and the 20th of August.

30th Question:—A. Daniel Williams (Nigger Dan) furnished the following extracts from his note book:—

1872.

Ice began to run in river, November 8th.
River closed November 28th.
First snow October 28th.

1873.

April 23rd, ice moved out of river.
Planted potatoes April 25th.
First permanent snow November 2nd.
River closed November 30th.

1874.

River broke up 19th April.
First geese came 21st April.
Sowed barley and oats April 25nd.

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River clear of upper ice May 3rd. N. B.—Upper ice from above the Rocky Mountain Canon.

Planted potatoes May 5th.

Potatoes not injured by frost until 22nd September. Then snow fell, which covered them, but soon went off. Dug over 100 bushels from one planting.

(This is possibly too large.—J. M.)

Ice commenced to run in river 30th October.

River closed 23rd November.

Snowed all night 4th November.

1875.

Ice broke up in river, 15th April.

Warm rains from north-west; blue flies and rain, 18th February.

Ice cleared out in front of Fort, 16th April.

Potatoes planted 8th, 9th, and 10th of May.

Barley and oats sown 7th May.

Snow all gone before the middle of April. This applies to both the river, valley and the level country above. Difference in level, 746 feet.

The following extracts are from Sir Alexander Mackenzie's travels. He passed the winters of 1792 and 1793 near Smoky River, and writes as follows:—

"7th November. The river began to run with ice yesterday, which we call the last of navigation. On the 22nd the river was frozen across, and remained so until the last of April." Between the 16th November and the 2nd December, when he broke his thermometer, the range at 8.30 a.m. was from 27° above to 16° below zero; at noon the range was from 29° above to 4° below; and at 6 p.m. it was from 28° above to 7° below. "On the 5th January, in the morning, the weather was calm, clear and cold, the wind blew from the south-west, and in the afternoon it was thawing. I had already observed at the Athabasca that this wind never failed to bring us clear, mild weather, whereas when it blew from the opposite quarter it produced snow. Here it is much more perceptible, for if it blows hard from the south-west for four hours a thaw is the consequence. To this cause may be attributed the scarcity of snow in this part of the world. At the end of January very little snow is on the ground, but about this time the cold became very severe and remained so to the 16th March, when the weather became mild, and by the 5th April all the snow was gone. On the 20th the gnats and mosquitoes came, and Mr. Mackay brought me a bunch of flowers of a pink color and a yellow button (*anemone patens*), encircled with six leaves of a light purple. On the other side of the river which was still covered with ice, the plains were delightful—the trees were budding and many plants in blossom. The change in the appearance of the face of nature was as sudden as it was pleasing, for a few days only were passed away since the ground was covered with snow. On the 25th the river was cleared of the ice."

31st Question:—A. The snow passes off so easily that as soon as it is off the ground and a few inches of the soil thawed, the ground is ready for seeding, because the soil is friable and the snow of little depth.

33rd Question:—A. The general character is bright, sunshiny warm days, and in certain sections of the country cool nights. Should rain come towards the middle of August and the moon be pretty near the full, there is generally what is called a light summer frost in certain localities, owing to the radiation of heat caused by the absence of clouds.

34th Question:—A. Yes, on the upper part of Peace River, but I have no record of any on the lower part.

35th Question:—A. Never general, always local, and all reported frosts from the Saskatchewan and prairie regions are of the same character and produced by exactly the same causes.

36th Question:—A. Yes; because the country will be better drained and hence will retain the heat.

37th Question:—A. As far as I am aware there are no summer rains. There are occasional showers, but apparently no rains of any consequence.

38th Question:—A. The character of September is almost identical with that of our very best Septembers here—a smoky atmosphere with occasional white frosts in the morning, but generally a calm atmosphere. In October the frosts get more severe towards the last of the month; about the 25th at Fort Chippewyan ice begins to form and the rivers and lakes soon close.

39th Question:—A. It has in reality no effect whatever; it does not seem to have any injurious effect on any tree or shrub that we have in the country.

40th Question:—A. Having just completed an examination of the whole grasses of the Dominion, I am safe in stating that the grasses of the Mackenzie River valley and those of northern British Columbia are of the most nutritious character, and are actually the grasses best suited for pasturage of any known to stock men or farmers. The grasses referred to are those known as red top, and Kentucky blue grass, or scientifically, *Poa Pratensis* and *Poa Seratina*, *Poa Tenuiflora* and *Ceesia*. These four species are well known to American stock men and are considered of the highest value. They are the commonest of the grasses in our northern forest region and along the foot hills of the Rocky Mountains. Three of these species are known in the eastern provinces. One of them is exclusively western and the greater part of the common pasturage of Ontario is altogether composed of *Poa pratensis* (Kentucky blue grass, or red top).

41st Question:—A. It grows all through the Peace River valley, but was particularly noticed on the plateau above Fort St. John in latitude 56. Here it was actually measured by myself and was found to attain a height of eight feet, while the weeds, such as the purple fire weed of the east (*Epilobium Augustifolium*) attained a height of seven feet. These are given in illustration of the wonderful luxuriance of the commoner plants on that high plateau. The vegetation throughout the whole Peace River valley is of the most luxuriant character, and it seems more like that of the tropics than a country drawing near the Arctic circle.

42nd Question:—A. Yes. I have noticed that cattle browse on the buds and lichens that grow on the forest trees of Ontario, and hence I infer that the lichens that grow on the trees and sometimes on exposed places in this northern country would be alike nutritious for cattle.

43rd Question:—A. A great part of the soil is, technically, what is called *loas*, and is evidently an alluvium—a rich alluvial loam, that in many of the banks of creeks and rivers seemed to not change in character often for over 100 feet. As regards the depth of soil on the Upper Peace River country and eastward to Lesser Slave Lake, the soil is of the very richest character and wonderfully productive, while on the Lower Peace River, down towards Fort Chippewyan, and where it comes in contact with the Laurentian rocks, there are large quantities of sand in the soil, but the grain, as indicated in my reply to another question, is of the very finest quality.

44th Question:—A. It is difficult to answer that question with any degree of accuracy, for this reason: that the whole country seems covered with some kind of soil, though not all equally situated for the production of grain. I may explain, the hollows, owing to the general levelness of the country, are marshy. The slopes facing south are dry and warm; the slopes facing north are cool and necessarily moist. It will be seen then that owing to local cause the percentage of arable and pasture lands would be very changeable and very variable, but this fact remains that were the country settled at least 75 per cent. of the land would be grain producing. This character of the soil extends all the way down the Peace River and from all accounts northward on the west side of the Slave River and the Mackenzie to at least latitude 62° and possibly as far north as latitude 65°. There are no accounts that there is any change at all—I am speaking now of the soil.

45th Question:—A. The winter climate is about as severe as in Manitoba. The effect of the cold is not so injurious to either vegetation or stock, because the country is less exposed to cold winds. Again, the spring, unlike that of Ottawa, is as regular almost as the rising and the setting of the sun, owing to the climate being uninfluenced by any extraneous circumstances. About the fifteenth of April is the average time of the opening of the spring flowers, and spring may be said to commence

every year at the same time (from the 15th to the 20th), every year without exception. Having a fixed spring, we know that we have a fixed summer. The warm weather continues and the heat increases on to the middle of August. Then there is a lowering of the temperature, and if rain occurs, local frosts. There is a beautiful September, and the ice begins to form about the 25th of October. That is the general picture of the whole year as far north as Fort Chippewyan. It is evident that as we go further north the spring opens later and the winter sets in earlier. The data given in answer to other questions will show this. Owing to the great length of day between latitude 56° and 65°, vegetation is influenced by the sun on an average 18 hours out of the 24, and hence in this northern region at least two hours a day, on an average, more sunlight is given for the promotion of vegetation, and therefore it is not unreasonable to expect a remarkable rapidity of growth, earlier maturity and a superior quality of produce. It seems to me that the coolness of the nights in June and early July has much to do with the wonderful productiveness of all kinds of vegetables that either grow wild in the country or are cultivated by man, and that the sweetness of the berries, and the enormous produce of the cereals are produced from the combined causes of this cool night and long sunshine.

46th Question:—A. I am not aware of any insect pest or any vegetable pest such as rust, &c.

47th Question:—A. There are records in the Meteorological Department at Toronto that have been taken at Dunvegan, Fort Rae, Fort Simpson and other points in the Mackenzie River Basin, which are available, and would very likely be of great value.

48th Question:—A. Yes. Lac la Biche, on the height of land above Edmonton, is noted for the absence of frosts in autumn, and in this case is ascribed to the proximity of the lake. Isle à la Crosse post is affected exactly the same way. In 1875 potatoes were killed by a severe frost all through Manitoba on the 18th of August, yet on the 22nd September I found the potatoes still green at Isle à la Crosse in lat. 56. The only way I could account for this was the proximity to the lake. The following figures will show the dates of the opening of Peace River and the first ice drift in the autumn for ten years:—

EXTRACT from the Hudson Bay Company's journal, Fort St. John, Peace River, for a series of ten years. Lat. 56°12' north, long. 120° west. Altitude above the sea, nearly 1,600 feet.

Opening of River.				First Ice Drift in River.	
1866—April 19	-	-	-	November 7	
1867 do 21	-	-	-	do 3 or 8	
1868 do 20	-	-	-	do 7	
1869 do 23	-	-	-	do 8	
1870 do 26	-	-	-	No record.	
1871 do 18	-	-	-	November 10	
1872 do 19	-	-	-	do 8	
1873 do 23	-	-	-	do 4	
1874 do 19	-	-	-	October 31	
1875 do 16					

49th Question:—A. The constant record of the Arctic travellers was that south or south-west winds always produced warm and clearing weather, while north and east winds brought down fog and snow, and the north-westerly winds cold weather. My own record of the winds in the autumn of 1872 and the summer of 1875 show that the west, south-west and south winds were the prevailing ones, and always produced a most agreeable temperature in autumn, and very warm weather in summer. In winter a south wind will raise the temperature, so that we have records of thaws in January on Peace River, and rains in November at Fort Simpson, and even as far north as Fort Enterprise, Sir John Franklin records the remarkable rise in temperature caused by this same wind at that northern point.

By the Chairman :

Q. What are the causes that produce these south-west winds you have just spoken of? A. Many causes have been given, but to me it seems that the true cause is the Great American Desert, which has an extent of nearly 500,000 square miles in the central part of the United States. This elevated plateau has a very light rainfall, and during winter is very much exposed both to the direct rays of the sun and to the influence of either cold or warm winds. This seems to be the point where the tornadoes which cause such devastation in the United States originate. By examining Dove's charts it will be seen that the isothermal lines rise to the north in a constant upward curve east of the Rocky Mountains, and we find that they ascend exactly in the same way to the west of the Rocky Mountains. The causes seem to be these: According to Maury the rain winds that supply the sources of the Mississippi, and therefore those of the Saskatchewan and the Mackenzie Rivers are drawn from the South Pacific Ocean and come up on the west coast in the north-east trade winds. When they reach the coast of Lower California, owing to the great heat in the valley of the Colorado, instead of passing on to the north-east, they are drawn inwards and they curve upwards towards the north, so that when they reach our boundary they are drawn in to the west or north and are drawn up through our whole prairie country and pass over as a mantle of warm air into the Mackenzie Basin, and so on to the Arctic Sea. Other winds are drawn in from the Gulf of Mexico, and these seem to coalesce with those drawn from the Pacific, and they too pass into this interior region and through to the north. It will then be seen that we actually receive north of latitude 49 deg. the heat and moisture that are drawn away from the American Desert and warm air from both the Pacific and the Gulf of Mexico, and that instead of the chinooks, as they are generally called, coming through passages in the Rocky Mountains, they are the indrift of the north-east trade, which may be here called a monsoon, because the same conditions that operate in Asia to produce the monsoons are actually in operation in North America, and produce the result indicated above. Maury says that Fort Yuma on the Lower Colorado has actually the hottest climate on the globe, and that the heated air passes up over the Great Salt Lake deserts, and our ranchmen constantly report that these south-west winds found in the region below Calgary have a wonderful effect upon the climate even in the depth of winter. On the other hand it has been asserted that these warm winds come from the Pacific Ocean through the various passes of the Northern Rocky Mountains. That this cannot be so is evident from the fact that the winds in winter that strike the coast of British Columbia after depositing their moisture have no perceptible effect in raising the temperature immediately west of the mountains, and if these winds do not raise the temperature immediately west of the mountains it is not reasonable to expect that they will raise the temperature of the region 200 miles further to the east, after passing over mountains over 10,000 feet high. It has been said that warm wind passes from the west through the Peace River Pass, and by that means heats up the plains immediately to the east. I was in this region in the summer of 1875, and stood on Mount Selwyn in the Peace River Pass at an altitude of nearly 7,000 feet, and from this point could look to the east and to the west-eastward from the mountain summit. The whole country had the look of the middle of summer, while to the west the aspect of the region was that of coolness and early spring. The strawberries at Fort McLeod, in latitude 55°, west of the mountains, were only in flower on the 6th July, yet on the eastern side at Hudson's Bay Hope they were fully ripe at the same date. On this same mountain I wrote that if the warm winds came from the west why did they not heat up the west before passing to the east? From that time to this that question has remained unanswered.

To sum up: The sources of the warm winds are deflected winds of the Gulf of Mexico and the north-east trades of the Pacific. The American Desert gets heated even in winter owing to its exposed surface and produces the Chinooks of the winter months, and the mantle of warm air that covers our interior and far north in summer. These winds are propagated from point to point by the surface becoming more

and more heated and on account of their inertia ; when once in motion they cannot be stopped until absorbed by coming in contact with other winds of a different temperature or density.

50th Question :—Over every portion.

51st Question :—A. The only attempts at agriculture and stock raising that have been made have been in connection with Hudson Bay posts and the various missionary establishments throughout the region. Horses and cattle have been found to thrive well in every part of the region where they have been introduced and no complaints have ever been made of an injurious effect by the climate, and diseases of every kind seem to be altogether absent.

52nd Question :—A. Yes. Both horses and sheep and cattle, but they would have to be treated in winter in the same way as we treat our own cattle in Ontario. My reason for answering in this way is this: our barren grounds are exactly analogous to the plateaus found in Norway and Sweden. On these plateaus the cattle and sheep are taken up and herded during the summer. In the winter they are brought down into the low country and wintered in the usual manner. Were any cattle or other animals herded on those northern plains in summer they would have to be housed and fed during the long Arctic winter. It then resolves itself into a question of profit and loss.

53rd Question :—A. The caribou, musk-ox and moose with a few wood buffalo and in certain parts a few elk. The caribou (barren grounds) and musk ox are very numerous on the barren grounds ; both live on the margin of the forest in the winter but the caribou retire much deeper into it than the musk ox. In summer both leave the forests as soon as the first hills are bare of snow and move constantly on until they reach the Arctic coast, in the meantime giving birth to their young, and in the early weeks of August they begin to retire from the coast and move towards the woods again, reaching them by the time that the hills are again covered with snow, and this seems to be their regular habit every year. The food of these animals is chiefly lichens and grasses of various species, the chief being the reindeer lichen and other species allied to it. Amongst those, however, that are very valuable on account of the mucilage they contain, are the various Iceland mosses. Besides the lichen these animals eat the various grasses that are found throughout the country they traverse, but in winter their sole food is the lichens that hang from the stunted forest growth, where they have taken up their abode. The trees of the barren grounds are precisely like those that are seen by any party or person who has climbed a mountain. Those at the summit of the mountain are completely covered with lichens and those on the borders of the barren grounds are exactly in the same state and therefore the food of the animals is hanging above the snow in winter.

The wood buffalo at the present time is very limited in numbers. Fifteen years ago they were reported to be in considerable numbers, in the country between the Athabasca River and the Peace River, but at the present all accounts confine them to a small region between Lake Athabasca and the Liard River in the neighborhood of the Salt Springs. Elk (wapiti) are still scarcer and are only to be found at the present time on the upper waters of the Athabasca.

Rabbits (hares) are in immense numbers in nearly all the forest region of the Mackenzie River Basin, they often become so numerous that the young growth in the forest is literally destroyed by their eating off the bark and the wood of the young trees in the winter time.

56th Question :—The following abstract from Blodgett's *Olimatology* will be of value in connection with the climate and productions of the Mackenzie River Basin :—

"It has been sometimes claimed that the central continental areas originate the higher developments of both vegetable and animal life, or those which are most valuable in the economy of civilization, at least. The cereals, and the more valuable and varied fruits originate here ; and Central Asia, or rather the central areas of the great continent made up of the three in reality, has been regarded as the point of departure for the most of the cultivated grains and fruits, the races of domestic animals, the predominating races of men, and the germs of civilization and of letters.

These represent the maximum activity of each, and it would certainly seem that climate is at the basis of this activity. The climates which represent the greatest curve of changes, both of a constant and of a non-periodic character, within certain limits of temperature, appear to be those most favorable to the activity of all vital forces, or to their activity in certain forces, and such forms as produce concentrated and lasting organisms. Such are the fruits and grains of the temperate and transition zones, and especially of the arid and interior climates of the old world. The analogies of climate certainly show that these may be transplanted to our own interior, and the absence of any abundance of these in a natural state here, is not conclusive against such an adaptation."

Another point I have noticed is that that part of Montana bordering on the Canadian boundary is elevated to an altitude of nearly 6,000 feet. From this point it slopes constantly towards the north, so that when we reach Lake Athabasca the altitude of the country is not much over 600 feet, and this fact taken into account will show that the difference of ten degrees of latitude is compensated for by the descent from 6,000 feet altitude to less than 1,000. Another point worthy of consideration is that our northern regions are not the home or the birthplace of the blizzards. It is a well established fact that the cold waves that are credited to the north actually originate to the south of the Canadian line, and are propagated northward and not southward, as it is generally supposed. Blodgett states on page 307 of his Climatology that "a most important point with regard to these facts is that in no case is it apparent that these cold extremes come from the north, or are caused by north winds, or an inflection of the polar atmosphere southward. The views previously suggested on this point that the cold in the lower latitudes in winter was produced mainly by continuously northerly winds blowing even perhaps from the Arctic regions, appear not to be supported in any case.

57th Question:—A. *Salmo Rossii*, Rich. (or Ross's Arctic salmon), is found in immense numbers at the mouths of the rivers flowing into the Arctic Sea near *Boothia Felix* or at Back's Great Fish River. At one haul of a small seine 3,378 were obtained. They varied in size from two to fourteen pounds, and rather exceeded six tons in weight. As an article of food this salmon was much relished by Ross' men.

Salmo Hearnii, Rich. (Coppermine River salmon)—This trout or salmon has red flesh and is similar in flavor to that of the common salmon but more oily—fatter. They were in incredible numbers in the Coppermine near the Bloody Fall. General weight from four to seven pounds.

Salmo Hoodii, Rich.—Hood's trout seems to be the same as the sea trout of the Gulf of St. Lawrence and Labrador, and is found in all the rivers east of the Mackenzie, both inland and at their mouths. General weight from two to eight pounds.

Salmo Mackenzii, Rich., *Inconnu*—This species is anadromous, like Ross's and Hearne's salmon, and ascends the Mackenzie River from the sea to Fort Smith on Slave River. Its flesh is white and rather soft at Great Slave Lake, but near the sea it is firm and hard. It is just possible that its flesh may be red when in the sea like the sea trout of the Gaspé coast. General weight from five to fifteen pounds. Some have been taken at 40 pounds weight. This fish comes between a trout and a whitefish.

Salmo signifer, Rich. (Back's Greyling), is a handsome fish taken in all the lakes and rivers of the Arctic regions. It is very game and takes all kinds of bait. It delights in clear water and is both an Arctic and mountain fish, as we took them in the Peace River tributaries in the Rocky Mountains.

Coregonus Albus (Whitefish) is truly the wealth of the northern Indians. From the great lakes to the Arctic Sea it abounds in all lakes of any size and in many rivers with clear water. Every person relishes it, and travellers and others can eat it as their staple food for months and not tire of it. Weight from two to eight pounds, though many have been taken twelve pounds in weight.

From the accounts of Richardson, whitefish and trout swarm in Great Bear Lake. He mentions that he caught in nets over 50,000 in 1825-26, and in eighteen months 3,500 trout were taken, none weighing less than two pounds and some

exceeding thirty. I may mention that the Great Lake trout is found in all the great lakes of the Arctic regions.

60th Question:—A. I am not acquainted with any part of the Mackenzie proper, but there is abundance of timber in the vicinity of Fort Chippewyan on Lake Athabasca. There are as fine spruce in the Athabasca delta as are to be found in any part of the North-West. I have measured trees on the Embarras River that were two feet and a half in diameter and were very tall. These trees could be cut and floated down to Fort Smith at the head of navigation without any difficulty. On the Peace River likewise, especially on islands, there are many large groves of spruce and poplar which attain extraordinary dimensions.

65th Question:—A. The Labrador tea plant extends all the way from Labrador to Alaska, and is one of the plants that is found on the extreme Arctic coast. It is widely spread in every part of the barren grounds and the sub Arctic forest. This is the food of the Arctic hare in winter.

70th Question:—A. The barren grounds and islands of the Arctic Sea are the breeding grounds and summer home of a dozen species of ducks, all our geese and swans, many of our waders, cranes and nearly all of the gulls and terns. From the accounts of travellers we learn that from the middle of April they keep moving northward and about the latter end of August they commence to move southward, and this is the invariable rule.

71st Question:—A. Geese and ducks, but especially the former. Indeed very far north it does not pay to shoot geese, as ammunition is too expensive. Many geese, however, are procured at the various Hudson Bay Company's posts for winter food. They are generally in immense numbers in the autumn, and it is no unusual sight to see lakes almost covered by them in the month of September.

72nd Question:—A. Geese, swans and ducks with innumerable waders are in the greatest numbers during the month of September, and are to be found on all the northern waters at this time. Ducks, however, owing to their peculiar food, prefer small ponds and marshes, while geese and swans feed chiefly on dry land or bogs, retiring to the water to rest.

73rd Question:—A. During the breeding season ducks of all kinds find their food in or around ponds and marshes, while geese feed upon berries, which grow in immense quantities on the barren grounds. The chief of these are crow berry (*Empetrum nigrum*), squaw berry (*Arctostaphylos uva-ursa*), and the Arctic raspberry (*Rubus Arcticus*), and bake apple (*Rubus Chamamensis*) sometimes called "eye berry." The two former are not injured by frost, and remain on the bushes over winter, so that they serve for food at all times.

74th Question:—A. During various dates of April, according to locality. In August the coldest and about the end of the month leave the Arctic coast, and move south as the weather gets wintery.

75th Question:—A. The usual summer food such as the succulent stems and tender leaves of various species of grass, and water plants and larvae of insects. Geese, as usual, prefer berries.

The spoon bill and pin tail breed far north in the barren grounds.

The gadwall, millard and widgeons breed in the wooded district along the Mackenzie. The green winged teal breeds far north, while the blue winged teal breeds generally south of latitude 54°.

The canvas back, red head, ring neck and scamp duck breed from Lake Winnipegosis north to the Arctic Sea.

The blue bills and buffle head breed in the wooded country chiefly.

The swans breed between latitudes 60° and 68°, and feed chiefly on aquatic plants, larvae of insects and frogs.

The blue and white wavies breed in the barren grounds and feed chiefly on berries.

The Canada lives in pairs and breed from the prairies to the Arctic coast.

Brant breed on the coast of the Arctic Sea and their chief food is of marine origin, but they also eat berries and grass.

FRUITS OF THE BARREN GROUNDS.

Rubus Arcticus (Arotic raspberry), two varieties.
Rubus Chamæmorus (bake apple, eye berry).
Arctostaphylos Alpina (Alpine bear berry).
Arctostaphylos uva-ursa (bear berry, squaw berry).
Empetrum nigrum (cloud berry).
Vaccinium uliginosum (blue berry).
Ribes rubrum (red currant).
Ribes Hudsonianum (black currant).
Fragaria Virginiana (common strawberry).
Fragaria vesca (wood strawberry).

FRUITS SOUTH OF BARREN GROUNDS.

Amelanchier alnifolia (poire or Saskatoon berry).
Prunus Virginiana (choke cherry).
Viburnum pauciflorum (high bush cranberry).
Vaccinium oxycoccus (low bush cranberry).
Elæagnus argentea (silver berry).
Vaccinium vitis idæa (often called cranberry).

83rd Question:—A. The chief food of the Indians in the country drained by the Churchill is whitefish. Many of them have gardens and raise potatoes. Many other kinds of fish are easily obtained, and rabbits and various birds with beaver and occasional deer and bear make up the remainder. Birds are their chief dependence.

In the Peace River regions moose and bear are the chief articles of diet, but fish are plentiful in some districts, as at Lesser Slave Lake and Lake Athabasca. The whitefish is the most esteemed. Beaver, rabbits and lynx are quite plentiful in many localities. As usual, birds are one of the chief articles of food.

Moose and cariboo are the chief animals of the Mackenzie River, but whitefish and trout of various species are extremely abundant in Great Slave Lake.

The whole Laurentian district north of Lake Athabasca is full of lakes which teem with the finest fish of the best quality. These can be taken at all seasons with lines or in nets.

Cariboo is the chief animal food, but bear and musk ox are common, the latter particularly in the northern part. Birds, especially geese, are the staple in all the north in spring.

86th Question:—A. There are only two species of rabbit or hare, properly speaking, in the Mackenzie River Basin. The common American hare (*Lepus Americana*) and the Arctic hare (*Lepus glacialis*). The first named is common in all the forest country from New Brunswick to the mouth of the Mackenzie River in lat. 68 deg. This little animal constitutes the chief food of the Hare Indians on the Mackenzie.

The bark of the willow is its chief winter food, but it destroys whole groves of Jack pine (*Pinus Murrayana*) when it is plentiful and willows are scarce.

The Arctic hare may be called the barren ground hare, as it is never found in the wooded country but in all the barren grounds both in Labrador and the islands of the Arctic Sea. Its chief food is the bark of dwarf willows and the evergreen leaves of the Labrador tea plant. It varies in weight from 7 to 14 pounds and is much superior to the American hare as an article of diet.

By the Chairman :

Q. What is the best way to get a correct knowledge of the value of the Mackenzie River Basin? A. To get a correct knowledge of the economic value of any country we must get a clear knowledge of its natural productions—I mean the various forms of vegetation on its surface and the various animals that feed on those productions. When we get those clearly in our mind we will see at once what the country is good for. It was by my knowledge of botany that I was enabled to say

clearly and distinctly seventeen years ago that the Peace River country and immense stretches of the prairie country were suitable for agriculture. Had I not had that knowledge I could not have made these statements. Had we a clear knowledge of the botanical productions of the various sections of that region, I could sit at this table and tell you exactly whether this tract or that one was suited for agriculture or not, simply on account of this, that every section of the world produces forms of vegetation suited to the climatic conditions. If certain climatic conditions exist in certain districts of the country, that is a proof that we have a climate suited for cereals, and as the Bishop well put it in his evidence this morning, the climate first, afterwards the soil. An investigation is absolutely necessary in order to decide these two points: hence it is by a knowledge of the natural products of the country that we are to know its value.

Q. Have you put in your evidence a list of the animals and plants of the region?

A. I have, but not a complete one of the plants; for this reason, there would be a number of hundreds that would scarcely bear on the question.

Q. Have you put in a list of the forest trees? A. Yes.

Q. And a list of the fruits? A. Yes; and I have mentioned particularly some of the grasses, and shown that these grasses are of the very highest importance. The *Poa pratensis* is the best pasture grass. It is called the Kentucky blue grass, because it was of such great importance in old times in Kentucky, and it is found a valuable grass still. Five-sixths of the grass in this country is the same: nine-tenths of our old pastures are the same grass, and then again all the old slashes or brulés are covered with it. When it grows on high ground our farmers call it red top or June grass.

By Honorable Mr. Merner :

Q. Is it the same grass that we have in Ontario? A. Yes; the only difference is that it grows on more moist ground and appears to be of greater economic value. This grass is considered not merely in this country and in the United States, but in Europe, one of the most valuable grasses known. It is both native in this country and introduced. I could give you a list of one hundred grasses that grow on the Peace River and the Athabasca.

By the Chairman :

Q. Will you give us the extreme northern limit of those grasses? A. The difficulty is this, as I said in answer to your first question, we have very little knowledge beyond what I have got myself from personal observation and what Sir John Richardson got, sixty years ago, before I was born; so I feel, standing before you to-day, the absolute necessity of a better knowledge of the productions of our immense regions. I can give you a list of all the grasses that have been found there. I have traced them to the top of the mountains and throughout a great extent of the prairie and forest regions, but beyond Athabasca Lake I have never been.

Q. The reason why we are solicitous about that question is this: we have to make our report in due time to the Senate, and the Senate will expect us to make some reference to the pastoral area of the country we are investigating? A. I have answered that by showing the valuable area on the map.

Q. What reasons can you give us, climatic or other, for this luxuriant vegetation? A. For years it has been known that the vegetation around Lake Superior is far more luxuriant than the vegetation to the east. Species growing in the woods here for instance may attain a height of three feet; there they are almost tropical in their appearance, they grow so luxuriant and so tall, and the question has been asked: "Why?" Here the atmosphere is comparatively dry and instead of a constant growth and a constant development of the parts at the very warmest time, the growth ceases. On the other hand, at Lake Superior, the coldness of the night seems to vivify the plants, and prepare them for another rush in the daytime. Precisely similar conditions exist in the Mackenzie River district. For eighteen hours a day or more, the sun pours down in that country, and the few short hours of the night certainly are comparatively cool; and it seems as if the vegetation was re-invigorated, and when morning comes again it goes on with another start, so that

the three months of growth in the Peace River region are three months of a rush. You see there is moisture enough, there is heat enough, and, I believe there is coolness enough—that naturally the coolness of the region is strengthening to the vegetation. So that we have the condition on that upper plateau of the most luxuriant growth, and the most remarkable productiveness. I am speaking now from a scientific standpoint and not from any guess, and I am prepared to follow these remarks up in a more elaborate manner if necessary. You can see at once the reason for this wonderful growth: heat, moisture, a re-invigorating time at night—because I contend that vegetable life wants a cessation of warmth just as much as the human species.

Q. We will just ask you a question there: You have stated that heat, light and warmth during the summer months are the conditions that cause this luxuriant vegetation on the plateau of the Peace River. I understand you to mean by that between the Peace River and the Liard River? A. Yes.

Q. How far to the north do these conditions extend—that is, the warmth, the light and the moisture—during the three growing months of the summer? A. I cannot answer that question from personal observation, but I have given a written answer that covers the ground. Instead of reading that answer I shall give you a few details, and you will see the simplicity of the whole matter at once. For sixty years past it has been known that the section of country extending say from St. Paul north-westerly, right down the Mackenzie Valley has been noted for the curving north of the summer isothermals. Now, many people say that the cause of the curving of the isothermals is the breezes from the Pacific Ocean. In my answer I have shown that I wrote on the mountain top in the Peace River pass that it was the duty of those breezes to warm up the western side of the mountains before they came across to the eastern side. They did not do so; therefore I dropped the western breezes entirely out of my calculations. You will ask, therefore: "Where does the warm air come from?" I have stated that, and the answer is given in other lines in my written evidence. I found on investigation that the rain winds of the American interior—that is the rain winds which supply the Mississippi and Saskatchewan, and if you choose the Great Mackenzie River, were drawn up by the sun down in the Southern Pacific; that they floated up on the North-east Trades, and when the North-east Trade struck the coast of America south of Lower California, that the air was so hot that they actually had no power to give out their moisture. The answer to this is given to-day: at San Diego in Southern California where rain does not fall for nine months, and sometimes not in a year. Then the Pacific winds and the Pacific moisture is constantly coming on that coast and the question is: "Where does it go?" It goes eastward and northward, and as it passes in on the land, it warms up the whole region above the normal temperature. Blodget, the great authority on atmospheric currents, states that at Fort Yuma, in the valley of the Colorado, there is actually the warmest climate, not alone in America but in the world, with an average temperature throughout the year of 73 degrees. What is the cause of the heat? It is the influx of the heated air from the south, loaded with moisture. Following this up we find that the isothermal crosses precisely in the same way up over the Salt Lake Valley, and passing north enters into our country in the valley of the Kootenay; and on the east side of the Rocky Mountains about the 114th meridian. From the boundary of British Columbia, this warm current passes up the Kootenay and the Similkameen, passing up into the Cache Creek country, and then passing north-westerly it crosses the Fraser, and past Fort St. James, Tatla and Babine Lake, and enters into the country which Dr. Dawson told you yesterday contained sixty thousand square miles of land, with a climate suitable to the growing of cereals. Then you see we have two currents of warm air—none of your little local matters, but two currents of warm air drawn inwards precisely in the same way that the high plateau of Asia actually draws the south-east trade on to it. We have the winds from the Gulf of Mexico and the Pacific drawn northward on account of the American desert in exactly the same way as in Asia. The American desert to the south of us is the father of our grand country to the north, as it gives us both heat

and moisture. It is the heating up of the wind in that desert that causes the spring in the Rocky Mountains and along the Peace River Valley to be ahead of the spring in the region where we now are. The Peace River in latitude 56 has its banks covered with anemones and other flowers to-day, while here, eight hundred miles to the south, they have not yet made their appearance.

Q. Are we to infer from what you say that these winds prevail down as far as the mouth of the Mackenzie River? A. Yes; because I have shown in my notes that when a current of air gets moving it cannot be stopped without a force greater than itself intervenes, which is a stream of air of a colder nature, and the two have to be absorbed before the cold overcomes this constant rush of warm air, and it cannot be stopped; consequently explorers have found that when those winds blow, they change the whole aspect of affairs in winter time. Instead of those little winds coming through the passes of the mountains, I maintain that there is a rush of warm air and moisture forced up from the Gulf of Mexico on the one hand and from Southern California on the other which passes west of the mountains, one part to the country that Dr. Dawson speaks of, and the other part down the Mackenzie River valley, and if you choose, out into the Arctic Ocean.

Q. You have told us of the influence of this mellowing temperature of the Mackenzie Basin extending as far north as the mouth of the Mackenzie River; will you define how far eastward these warm winds extend? A. The map is not suited, but I will give it to you on certain points. Many of the gentlemen who have ranches at the eastern base of the Rocky Mountains say: "We only have the Chinooks." Gentlemen living as far east as Moose Jaw, say: "It is not so, we have the Chinooks." I wrote twelve years ago that the Chinooks were not local, but that they were the warm winds I have described now. When it is known that the Chinooks have an ameliorating influence as far east as Moose Jaw, 500 miles east of the Rocky Mountains it is as well to ask does it affect the country still further east. One of the gentlemen before this Committee—Captain Craig—has told you that they have the Chinooks at Prince Albert, and I whispered to him, "if they pass to Prince Albert, are they not north of that?" I found potatoes still green at Isle à la Crosse, lat. 56°, on September 22nd, 1875, and that same year the frost killed the potatoes in Manitoba on the 18th of August. Now, you may ask me why was there no frost on that higher plateau when it occurred in Manitoba? Water and warm air are my answers. I have shown in my notes that these so-called blizzards are from the American desert; that they actually come from the south and not from the north as we say, and that the Arctic winds that are being talked about by newspaper men are actually propagated from the south and west, and they appear to be north simply because the wind is from above, and not our surface wind from the north.

Q. Then you think that the latitude of Isle à la Crosse is within the limit? A. I certainly think it is within the limit, and I do not stop even there, because I find that Sir John Richardson when living at Fort Enterprise, near the Arctic circle, latitude 65°, longitude about 115, thought they were there in 1819 when he recorded that on the 19th of November the south-west wind blew and it rained, and when the south-west wind blows in any part of our great interior, if it does not rain the moisture disappears and the snow disappears. And the grand south-west winds that God is sending on our country never vary, because they are in a fixed circuit, and no outside circumstances vary them.

Q. This is a very important communication we have received stating that the south-west wind is a wind of the Mackenzie Basin? A. It is the indraft of winds of the nature of monsoons. They are the winds drawn in from the Gulf of Mexico and from the Gulf of California, and the great American desert is the cause of their being drawn in, and is literally the disperser of them to the north.

Q. You have given us two eastern points, one Isle à la Crosse and the other is a fort built by Sir John Richardson. Could you give us any intervening point for which there is any record of these warm winds? A. I have mentioned in my notes that Sir Alexander Mackenzie, wintering at the Forks of the Peace and Smoky Rivers, found that when the south-west wind blew in the winter it got warmer and

the snow never got deeper, and as early as the 15th of April the anemone was in flower upon the whole land. I find from every record that from the 15th to the 22nd of April in every year anemones are in full bloom over the country.

Q. Are they in bloom here now? A. No. My son was out yesterday and he could find no trace of them. I have shown in the notes that actually the spring comes from west to east at the rate of about 250 miles a day, and it is an absolute fact that from Winnipeg westward up to the Peace River District, the winter is propagated in the same way, only it passes from east to west at the rate of about 250 miles a day. We know that spring is mentioned as having taken place in Winnipeg about a week ago, and we are having our spring commence here to-day. That shows that the spring is coming from west to east here, and I believe, as I said in my first answer, it is our duty to study the natural history and the meteorology of the country thoroughly, and then we will be able to give clear and distinct answers to plain questions.

Q. You have told us about Bear Lake and Lac à la Crosse; can you tell us anything of Great Slave Lake? A. The difficulty about Great Slave Lake is that it is full of islands at the head of it, and the ice remains there very long in the spring, so that the head of Great Slave Lake may be said to freeze to a great depth in winter, and is unfavorable to the breaking up of the ice in the spring, and it remains there and has a chilling effect both on the lake and the surrounding country. I read the notes of Mr. Anderson's father on the upper region and find that after they got outside the influence of Great Slave Lake, it showed at once that the country had a better climate than down close to the lake owing to the ice remaining there, as I said, until a late period in the spring.

Q. The other end of the lake appears to be free of islands? A. Yes, it is free of ice between the 25th May and the 5th June; but the east end, from all I can gather, is icebound late in June, and it does not break up from the agency of the wind but through the agency of the sun, and you know the difficulty in that case in getting rid of it.

Q. Then we come down to the limit you mention, the Athabasca Lake. Can you tell us the effect of the warm winds on the climate there? A. I could not answer that question. I do not know anything about the eastern end of the lake.

Q. We are to understand then that there are climatic conditions favorable to the growth of the grasses suitable for a pastoral country, extending all along up the Mackenzie River to its mouth. Now, the other quality which you said was necessary was soil in which to produce those grasses. What is the character of the soil? Can you draw a line roughly between the alluvial country and the rocky country there? A. Yes, it is very simple. The hills beyond this river—the high hills—are very nearly barren. Why? Because they are composed of what is called Laurentian rock. Along the base of these rocks we find the rich valley of the Ottawa. Why is the valley of the Ottawa rich? Because its soil is composed of the disintegration of rocks of a different class altogether from the rock of the Laurentian hills—limestone and kindred rocks. Now, the Mackenzie valley and the whole of the northern prairie country has a soil that is largely composed of what is called alluvium; and as we pass northwards further down the Peace River to the Mackenzie, the surface, from all I can gather from what I have read, is precisely the same character as the second prairie steppe, which is a surface soil of black mould mixed with limestone gravel, and when you go deeper down there is more gravel and sand in the sub-soil. Ten years ago it was said that all our prairie was gravel and sand. Why? Because the first explorers saw the badger holes the sub-soil from which was gravel, and they said it was the natural soil of the country. Many people speak of the soil of the Mackenzie River from just such cursory observations; but the whole of the country from Edmonton north-westerly to the Arctic Ocean in the Mackenzie valley is underlaid by Devonian or cretaceous rock, and by the disintegration of these rocks good soil is produced always. From everything I can gather, the whole region out to the Arctic coast west of the Mackenzie River has a good soil. Easterly we strike a land of barrenness naturally.

Q. The line of the Mackenzie is not exactly the line? A. No. Our geologists know that there is a portion of the valley east of the river and up to the base of the Laurentian rocks where the land seems to be good—I mean as regards the soil.

Q. I would like to ask you what extent of that country is practically unknown, its natural history and its flora? A. I may say that in reality the north is unknown and—I speak inferentially—as much now as it was sixty years ago. You might ask me why? Because we are not awake in the matter; because we are depending on the past, and doing little in the present. I stand before you to-day talking about what I saw 17 years ago in the Peace River country, and I may just say that going down one river and up another river is never going to show what is in the country. We must learn what is in the country in some other way. Then you may ask me how do you know the truth of what you have told us? I answer you as I did Mr. Mackenzie ten years ago. He said: “Mr. Macoun, you have only been on certain lines in the prairie region, how can you stand before us and tell us that this North-West country is all good?” I said then as I say now about the climate, the characteristics of that region are general and not particular, that is, what you find in one place you will find 100 miles from it; so that knowing a few points, we answer that all between are equally good. As the Bishop said in his evidence this morning, the country round Isle à la Croix is nearly level. He gives you in about a dozen words the actual characteristics of the country, because I have been there and have seen it myself.

The CHAIRMAN—Notwithstanding all the efforts that this Committee may make, the interior of that country will never be really known to Canada until scientific men especially sent there for that purpose have explored it thoroughly. I say this from the fact that it came incidentally under our notice last session, before a committee of a similar character to this that a great amount of the information that was given us might almost all be found in a very excellent work of His Grace Archbishop Taché. That distinguished prelate had in his earlier years made extensive missionary trips not only throughout the diocese that he now presides over, but over the whole country of the North-West and, being of an acute and observant mind, he recorded matters that he saw, never thinking at the time of their importance, but which afterwards has been one of the greatest contributions to our natural history, our botany and our general knowledge of the North-West. His footsteps have been followed by the Rev. Father Petitot, whose map in this book, I have no hesitation in saying, is a better map than any of the Government maps on our walls, and whose information, from the little knowledge I have of the French language, I consider is of the greatest value. So that it is quite true, as the Professor says, and I hope the sub-committee who is appointed to draft our report to the Senate may recommend to that body the advisability of following the footsteps of Bishop Taché and Rev. Father Petitot and others, in sending into that country, for the purpose of exploring it, a class of explorers who have done so much for the southern region, and which has made the name of Professor Macoun known over Canada and the entire American continent, and perhaps wherever the English language is spoken.

Professor MACOUN—Before referring to the agricultural products, with your permission, I will read my answer to the 56th question. It is chiefly an extract, but I want to show that the extract has greater force than any of us seem to think.

(Witness here read extract.)

That was written by Blodget over forty years ago, and to-day that statement is true in regard to Central Canada—that part of Canada lying to the west and north of Winnipeg which has been proved to the world that the wheat of our North-West is superior to anything raised elsewhere. Why? The answer is in my hand. The men on those plains are the men of the future. Why? The men raised on these plains are the men who will be fearless, strong, and hardy.

The CHAIRMAN—I would suggest that perhaps you are travelling out of the record.

Professor MACOUN—This is what I want to draw your attention to—that Central Asia was the home of the race. It is where we get all our grains and fruits and men of any power: and we in Canada have got a plateau of the same character, and on

that plateau perhaps after I am dead, but I trust before, we will be raising all manner of produce of the very highest quality and in immense abundance, because the prolific power becomes greater as we pass towards the line of extinction. That is the law. That is where the cold becomes so great that it will not produce leaves or anything else, the plant aims to produce its kind. We will follow that up: speaking of fish, do we not know that all the valuable fish of the world belong to us, both in the sea and in our lakes and rivers? Have we not got more trout, more salmon, more whitefish, all of the salmon family, and considered the very best food in the world—have we not got cod on the western coast and on the eastern coast? All these things—a prolific soil and a grand climate, and what do we want? We want the country better known to ourselves first, and then we will be able to tell the people it is a land perhaps not flowing with honey, but it is a land teeming with everything that makes the heart of man glad.

Q. You have stated that in regard to plant life that north towards the extreme limit of its possible cultivation it elaborates more seed than further south? Are we to understand from that that where wheat and barley and oats would grow at all, the larger will be their yield? A. Yes; I can prove it in two minutes. I had the honor when in England two years ago of reading a paper before the Royal Geographical Society of England, and at that time I took upon me to speak of our North-West and its productions. I took in my hand heads of wheat grown in Kent and Surrey. I have now in my hand heads of wheat and barley grown at Dunvegan in latitude 56, brought here by Dr. Dawson in 1879. Anyone examining these heads will see that the fascicles contain from four to five grains—an average of $4\frac{1}{2}$ grains to the fascicle. Had I heads of wheat grown at Ottawa I would show you that the fascicles contain 2 and 3 grains. When I was on the Peace River in 1875, I got wheat at Lake Athabasca that contained five or six grains to the fascicle. The Kent and Surrey wheat that I spoke about contains 3 and 4 grains to the fascicle, and I turned to the English gentlemen, and I said: "I can prove to the wonderful productiveness of the Canadian North-West. If the farmers of Ontario, with their two and three grains to the fascicle can produce 25 bushels of wheat to the acre, under the same conditions the men of Manitoba will produce 35 to 40 bushels to the acre, and those of Peace River will run up above 40 and those further to the north still more, granted that the same acre produced the same number of stalks. It is a known fact that all fruits and grains produce more abundantly as they approach their northern limit, and it is a known fact likewise that the human species as well as the lower animals are more fruitful in the north than they are to the south. So that taking it as a whole, it can be easily seen how to account without any stretch of imagination for the wonderful output of wheat from Manitoba last year.

By Honorable Mr. Girard:

Q. Do you know if any wheat of the Mackenzie River has ever been exhibited and taken any prize? A. Yes; some that I obtained from the Catholic missionaries at Athabasca Mission, was awarded the bronze medal at Philadelphia, in 1876. It was forwarded to me, but I said that it did not belong to me but to the missionaries at Athabasca.

By Honorable Mr. Turner:

Q. How do you account for the three or four grains to the fascicle in the wheat of Surrey and Kent, as against the greater number in the North-West? A. I will reply to you as I did to the gentlemen of the Royal Geographical Society. I said to these gentlemen: "These heads of wheat are from Surrey and Kent; if I had wheat here from Fife, in Scotland, I tell you it would contain four or five grains to the fascicle, because in Fife, you are drawing near the northern limit of successful cultivation.

Q. Surrey and Kent are a good deal further south than Ottawa. How do you account for the wheat of Surrey and Kent having more grains to the fascicle than the wheat at Ottawa? A. The climate of England is very uncertain as regards wheat growing. It is a law of nature that a temperature of 59 degrees for two months in the summer will perfect it in England. We want about 60 degrees here in Canada, as it is a continental climate. If they have only 58 degrees in England, the crop is

comparatively poor, and at 57 degrees it is almost a failure. Now, England having an insular climate and a low summer temperature, comes nearer the limit of successful production of wheat than this region here, and I might mention this in connection with the province of Quebec. On the Gaspé coast I found at Little Metis, wheat nearer in quality to that of Manitoba than any I have yet seen between Winnipeg and that point, and I came to the same conclusion, that at Little Metis it was drawing to the limit of successful production, and it is therefore a better sample and was more prolific. I might mention that at Fort Vermillion, in latitude 55° 24' in 1875, the barley was ripe on the 6th August. Below that, 50 or 60 miles, is a small fort called Red River. There a Frenchman named St. Cyr had a garden, and he told me he had a particular thing growing in the garden that he did not know anything about. I went out to look at it, and there was a splendid patch of cucumbers, many of them ripe. That was in August. I said: "These are cucumbers; how did you start them?" He said: "I got the seed from England and put it in the ground, and that is what has come from it." I passed down the Athabasca to the Mission, and I found growing on soil that would be of no value here whatever, sand and muck, an old swamp where they had planted wheat on the 5th of May, and I found it in the stook on the 26th of August, and brought away from it the grain that took the prize at the Centennial. I exhibited it in Manitoba before Consul Taylor and many other gentlemen, and the matter of the number of grains in the fascicle was then discussed and made public. They took a quantity of the wheat from me and shelled it, and Mr. Gouin, Inspector of Inland Revenue weighed it, and it showed a weight of 68 lbs. to the bushel.

By Honorable Mr. Howlan :

Q. Was that the imperial or the Winchester bushel? A. That I cannot say, it was the standard bushel of Canada.

By the Chairman :

Q. In what year was that? A. It was the year 1875. It was the wonderful flintiness of this wheat that gave it its weight. I am giving Mr. Gouin as my authority for the weight of the wheat.

Q. It is a very important matter that has been suggested by the Senator from Prince Edward Island, and it would be well to verify it. My own impression now is that the standard then in use was the old standard.

By Honorable Mr. Girard :

Q. Have you resided in the Saskatchewan district for any length of time? A. I have been up and down the country for eight or ten years, but never resided there.

Q. But you have been able to ascertain how the people live—on what food? A. Yes.

By the Chairman :

Q. We find that they were sold in London last year by the Hudson Bay Company, and by C. M. Lampson & Co., 114,359 otter, 7,000 fisher, 2,000 silver fox, 7,000 cross fox, 85,000 red fox, 10,000 white fox and 1,500 blue fox skins. Are all these animals peculiar to that country? A. Not exactly peculiar, but they are all found in that region.

Q. What is the probable proportion of those furs that came first from British North America, and secondly, what proportion of those came from the Mackenzie Basin? A. I will give that in in writing; I would rather not mention it off hand.

By Honorable Mr. Turner :

Q. Besides the usual birds, ducks and geese, and all those water fowls, have you the songsters that we have here? A. Yes; for instance, the robin which goes on steadily north. It comes just the way it comes here, and appears at regular intervals at certain points, until it gets up as far as Port Enterprise, lat. 65°, on the 11th June, and begins to breed there right away. So that the robin, like everything else keeps moving up with the opening of the spring. I might here make a statement about the birds to show the simplicity of the whole matter. Many people think it a wonderful thing, the migration of birds. Indians migrate precisely as the birds do. Birds migrate in the autumn on account of the want of food, and they keep going south-

ward as the winter comes, until finally they pass down beyond a limit where they can get food without much difficulty. Now, why do they come back in the spring? For the purpose of breeding. They pass south for food; they pass north to breed. What birds come first? We see the geese high up. Why do they come ahead of the ducks? Simply because the geese live upon diet which can be found earlier than the food on which the ducks live. Many people think the goose is a grass feeder, and lives upon muddy bottoms; but if you look at the bill of a goose you will see at once it was never intended to dabble in mud. The goose is a berry feeder, and he goes north until he reaches the borders of the barren grounds just as the hills are cleared of snow and feeds on the berries that are found in innumerable quantities over the whole of that country.

Q. Have you plover and snipe and birds of that sort up there? A. Yes.

Q. And the crow? A. No; the crow does not go as far north as the barren ground; but the raven ventures far north into the Arctic circle. The golden plover breeds away out near the Arctic coast and up in the barren grounds, and congregates in flocks and reaches our prairies about the middle of September, and here later.

By the Chairman:

Q. Where do the geese winter? A. That I could easily find. A large number of them winter about the mouth of the Mississippi River.

Q. What law of nature provides that they shall breed north in the summer rather than breed south in the winter? A. I might mention that protection for their young is the maternal instinct always, and it seems to be very strong in the bird. The great aim of the bird is to find a place to nest where it will be unmolested. The most timid bird will fight desperately for its young. They go north to nest, and every species has its own particular region or locality in which to meet. For instance those little warblers we will see here in abundance by-and-bye will pass north, and some gentlemen writing on our forest will say that the Canadian forests are filled with birds. Such is not the case however. In many places you may travel through the forests day after day in the summer and never see anything but a woodpecker. Then where are the birds? They build along the streams where there is an abundance of larvæ in and around the water, and food can be obtained for their young. Follow this principle out and you will find the same thing influences the larger birds. They always breed where food for their young is most plentiful. If time permitted I might go through the whole list of birds and show the simplicity of the thing. They pass down from the north forced by the Arctic cold; they go north in the spring to breed and feed their young.

By Honorable Mr. Turner:

Q. Have you seen the buffalo in the Mackenzie Basin at all? A. I have not seen it in life, but I have seen it in death.

Q. They are there? A. Yes.

Q. What part do they inhabit? A. It has been said before the Committee here that they are only found at Salt River. That, in my opinion, is a mistake. They are found on Salt River, that is to the west of Slave River; but there are still a number in the poplar groves and thickets in the country lying between the forks of the Athabasca and Peace Rivers. When I was there 15 years ago, it was said the buffalo existed in thousands. Now the number is brought down to about 200 in a band in the country I have mentioned to the east of Peace River, and about 600 on Salt River. The last buffalo on Upper Peace River were killed in the winter of 1871 and I was there in the summer of 1872.

Q. So there are really no buffalo now in the Peace River District? A. No, none.

Q. Are you capable of judging sufficiently from the fauna and flora of the country, its general fitness for the domestic animals we have amongst us? A. Yes; and would be glad to answer any question you ask me on that point. I might mention that twelve years ago the same question was put to me by another committee in the House of Commons. That was before any cattle were sent into that prairie country towards Calgary. My answer was this, the buffalo live on our

great plains in immense numbers; they are living there now. What is to hinder our common cattle from living on the same plains? The answer was, they would be more exposed, and their coat is not suited to the climate. The reply I made then, I make now: On the coast of Africa the dogs are without hair. Why? Because they do not need it. In this country they have hair. Further to the north the hair changes to wool. Why? To give them a covering to protect them from the cold. I have been told that our domestic cattle since they have gone on the prairies in the vicinity of Calgary and other parts of the North-West have thicker hair; it is becoming more woolly, and the cattle are becoming thoroughly acclimatized. The Bishop in his evidence said that away up to the north, as far as Fort Providence, on Slave Lake, cattle and horses do excellently well. The products of the country are precisely suited for such animals.

Q. Perhaps I did not make myself intelligible; what I wanted to find out is this: In travelling a country, such as you have described, with an area of sixty thousand square miles, whether you can establish from the facts of the fauna and flora that it is a region suited for domestic animals? A. Yes; the appearance of the grasses in any region settles at once the question with me of its climatic capabilities; and the country produces naturally always the animals suited for that locality. The deer, such as our jumping deer as it is called, ceases to exist as we go north, and immediately another deer takes its place, with a foot better suited for the Arctic regions—I am speaking of the caribou. Then we find the wapiti always existing along the base of the Rocky Mountains, and eastward to the prairie and copse wood country. The moose is more a copse wood animal, and is more fitted to go through it than through thick woods; so that any animal you will find in the country indicates the character of the country. Speaking of furs, if you mention a certain tract of country which produces the musquash in great numbers, you can take it at once as a fact that the country is a marsh country, because the muskrat exist only in marshes; but if you said it was a beaver country, then I would picture to myself a country of small streams and groves and lakes, where they could get their proper food. The character of the animals of a country at once indicates the character of a country. If you tell me of a country in which there are vast numbers of fish, I will say to you it is full of lakes and small streams.

By the Chairman:

Q. You have shown the reasons from the fauna. Now, from the flora, can you give the same explanation? A. Of course the flora is the food of the animal that eats grass. We have no poisonous grasses, and animals that eat grass will certainly exist in great numbers where grass is constantly to be found. In former times the buffalo lived as far north as latitude 60° and were in great herds. A few remain to this day. Is this not a living answer? Then the deer that feeds on certain plants will always be found where its food exists. The caribou does not come to our southern regions, because it prefers the lichen which is its staple food. That is the reason why, in the east, you will find the caribou continually on the high mountains.

By Honorable Mr. Girard:

Q. What was your bill of fare there every day while exploring that country? A. In the spring the first geese that are seen to fly fill the hearts of the people from Winnipeg to the Arctic Sea with joy, because it means fresh food. Following in the wake of the geese come the various kinds of ducks; but I need not say that it does not pay to shoot ducks away in the north, where ammunition is more valuable than the ducks. The goose is the food of the whole country in the spring, and it is an indication of spring. Then when they begin to lay, their eggs become the staple food, and many a big omelet I have seen made out of half hatched goose eggs. Honorable gentlemen must be aware that a half-hatched goose egg is not a rotten one. When you open the egg and take out the half-hatched chicken that is in it, the portion that remains is just as good as when the egg was fresh. Then comes the spring, and everywhere throughout the country the Indians and everyone else set their nets, if they are on a lake, and they get any quantity of whitefish and trout. The winter food in the north is chiefly wild geese, dried, and dried caribou

meat. Thirty or forty thousand geese are killed at Fort Chippewyan every year in the autumn for the purposes of food. Fresh fish are to be had at nearly all the posts at any time. When I say fresh, they are frozen in the winter, but still fresh.

Q. Have you had to starve on any occasion there? A. Yes; I starved on one trip three different times, but it was simply because we carried hardly anything with us, and sometimes the wind would get up and we would be prevented from moving and could not get fish with our nets. If you know how to set snarers for hares you can generally get them, but if you do not know you might starve. The difficulty is not so much in the scarcity of food as in the getting of the food; and I have shown in my notes that at the mouth of one river which runs into Boothia Felix, Sir James Ross and his men got there six tons of salmon at one haul of their net. On the Coppermine River the fish were actually so thick, both Hearne and Sir J. Richardson say, that to put in a little gigger and dip it up would bring up three or four large salmon at a time.

By the Chairman:

Q. The mouths of those rivers that you mentioned are south of the Mackenzie, but all our witnesses agree so far that the waters are colder than the water at the mouth of the Mackenzie. The salt water salmon exists at the mouth of the Mackenzie? A. I mean salt water salmon in both of those cases. The Coppermine salmon and Hearne's salmon are salt water fish.

By Honorable Mr. Turner:

Q. Are they the same salmon that we have in the east here? A. Pretty nearly, but Sir John Richardson thinks they are a distinct species, and has given them different names; but they are the true salmon.

By Hon. Mr. Girard:

Q. That is not the British Columbia salmon? A. No; it is different altogether. Those salmon are not found at the mouth of the Mackenzie, and I will tell you why: in nature there are fixed laws. There are no salmon at the mouth of the Mississippi but there are salmon in the mouth of the St. Lawrence. If the St. Lawrence was a muddy river, salmon would not frequent it. Now, the Mackenzie River, as I mentioned in speaking of the agricultural lands, runs largely through alluvium, and it is a muddy river, and salmon will not frequent muddy water.

By the Chairman:

Q. Part of the Fraser River that I saw last year was as muddy a river as I ever saw in my life. How do you account for salmon frequenting the Fraser? A. I will put it in another way, and I will take Senator Howlan as being my exponent. You know, so do I, that the Fraser River, though a muddy river towards its mouth, has a gravelly bottom and sides. They are not mud bars at all, and after you get above Yale you lose the mud and get right on to the bars such as salmon like to be working upon. So that although the water is muddy, it is not muddy in the true sense; it is milky, but not muddy, and there are many gravel bars as you ascend the river. The Fraser delta is not 100 miles in extent, and then you get up into the river where the whole banks and bottom are gravel. It does not follow that salmon would not ascend the Mackenzie, but the fish that do go up the Mackenzie from the sea, the *inconnu*, or unknown fish, is not a true salmon. It is a sub-genus that comes between the whitefish and the greyling, so that it is not a true salmon; nevertheless it lives in the sea and in the river. I mention that in my notes. It has hard, good flesh down near the sea, just as it leaves the sea to enter the river; but when it arrives at Great Slave Lake, and ascends the Slave River it apparently becomes softer and of much less value—precisely the same as the Stewart Lake salmon in passing up the Fraser. They get very poor as they arrive at Quesnel and at Stewart's Lake are much worse.

Q. Is the *inconnu* an entirely different fish from any other species that you know of? A. Yes; entirely different.

By Honorable Mr. Turner:

Q. So that there is no salmon at all in the Mackenzie? A. No, but they are abundant in all the other rivers. Our great lake trout are found in every large lake

right across the continent. There is not a great lake or great river without them; and when you read of the grey trout it means the big trout of our own great lakes. There is no lake in the whole northern country that is equal to Great Bear Lake for the numbers and value of its fish.

Q. And you say there is abundance of salmon in all the rivers east of the Mackenzie? A. Yes.

By the Chairman :

Q. We would like to know the localities where capelin are to be found? A. The only place I know of them being found is in the waters around Boothia Felix, and around the mouth of Back's Great Fish River, and on sandy shoals in Bathurst Inlet.

By Honorable Mr. Turner :

Q. Are there any known Atlantic coast fish found there, such as herring? A. They have been taken in Bathurst Inlet.

By the Chairman :

Q. Does the *inconnu* exist in large numbers in the Mackenzie? A. Yes; in immense numbers.

Q. Have you any definite information as regards the quality of the fish just as it leaves the salt water? A. Yes; I am speaking now from authority. I travelled a month with Mr. King, a clerk of the Hudson Bay Company, who has been for twenty years in the Mackenzie River country, and the *inconnu* was the burden of his talk, simply because it and the whitefish were the staple food of the people of that part of the country for a great portion of the year. The *inconnu* has white flesh when it is found up at Great Slave Lake; but I am not prepared to say that it has not red flesh when it is down at the mouth of the Mackenzie. The reason I say this is, the sea trout of the Gulf of St. Lawrence have red flesh when they come out of the sea; but when they ascend into the interior, 30 or 40 miles, after they have been in the fresh water for about a month, the flesh is white. I predicate from that that the *inconnu* may have red flesh at the coast.

Q. What size are they generally at the mouth of the river? A. They run from 5 to 10 lbs. in weight.

Q. They are an ugly shaped fish? A. Yes, awkward about the head.

Q. Have they a tail like the salmon? A. The tail is a good deal like the tail of the salmon. In shape it is a fish between the whitefish and the salmon; in parts it is like both, but it has not the depth that the whitefish has, and has a coarser head than either.

By Honorable Mr. Girard :

Q. Are they found in large numbers? A. In immense schools, so Mr. King told me.

Q. Do they go with other fish? A. No; they seem to keep together in great numbers.

Q. Are they found on the Alaskan coast? A. No; I never heard of them outside of the Mackenzie River. I have never heard of them going up Bear Lake River.

By the Chairman :

Q. Of course the whole of our enquiries are directed to determine if possible the future commercial value of those fish? A. This fish is considered very inferior to the whitefish of the north.

By Honorable Mr. Howland :

Q. It must follow that there are smaller fish where the *inconnu* feed? And if there are fish to feed salmon, there must be fish there to feed cod? A. Trout are found at the mouths of those rivers in myriads.

Q. The whole catch of sea trout, of Canada and Newfoundland and United States put together do not amount to 150 barrels a year? A. Sir John Ross, at the mouth of one of those rivers in Boothia Felix, with a little seine that his men put in at the mouth of one of the rivers, took out 3,800 fish, weighing from 2 to 8 lbs. each—salmon—over 6 tons in weight. Sir John Richardson says that, in 1825, when he was wintering on the northern arm of Great Bear Lake, he took out 50,000 whitefish and over 3,800 trout in eighteen months that he was there, weighing from 5 to 30 lbs.

each; and that other fish were there in innumerable quantities. Just as the Honorable Senator from Prince Edward Island has remarked, where there are the larger fish there are innumerable quantities of small fish.

By the Chairman:

Q. Back's greyling has often been mentioned; what kind of fish is it? A. It is one of the most beautiful fish I know of. It is more beautiful even than the mackerel. Back's greyling is an Arctic and mountain fish. It is found in the Arctic regions, up in the barren grounds. We caught them in numbers in the mountain streams in Peace River Pass, latitude 56°, and when they took the bait they would jump clean out of the water many times a couple of feet or so, and of course the beautiful colors glistening in the sun made us thrill with excitement. But the eating of the fish was a different matter. We found that they were a white fleshed fish, not anything like as hard as the trout, so that we did not care for them as food.

Q. How long is Great Bear Lake open during the season? A. Sir John Richardson says that the ice goes out of it about the last of June, and it begins to form on it about the latter part of September. Of course I can give the exact date that he gives. He mentions that the lake is so deep and so large that the centre of it is not frozen until late in December, or even in January.

By Honorable Mr. Merner:

Q. I suppose they cannot catch fish in the winter time? A. Yes; they catch them through holes cut in the ice in the lakes, and the outlet of Bear Lake never freezes over, and the Indians move their fisheries there and get fish all through the winter.

By the Chairman:

Q. Is the fact of the outlet not freezing due to the rapidity of the current? A. No. When I was in the north myself we never found the outlet of a lake frozen.

Q. We would like now to hear a little about the northern and eastern limit of the forest trees in the Mackenzie Basin? A. I will answer that by making a comparison first. Most, if not all of us, have travelled through the Rocky Mountains, or we have climbed a mountain and have seen the changes that occur as we attain a higher altitude. Now if you picture in your mind the passing through a thick forest on a mountain at the base, a sparse forest as you get higher until you finally attain a height where there is no timber, you have a picture of passing through the forest country to the barren grounds. As you go up the slope of the mountain the trees are more stunted and they become covered with lichens, and as you go higher up still the trees become so covered with lichens even on their smallest limbs that the tree looks white rather than green. Now picture to yourself a region where those trees become so stunted that they are only from five to twenty feet high, the limbs almost to their very tips covered with white lichens, and you have the forest and a picture of the barren grounds. Along the river side they have moisture of a certain kind and better soil, consequently better timber, so that if you look upon this barren ground region as being bounded by a straight line drawn diagonally from the Fort Churchill to the mouth of the Mackenzie River, you have an idea of the extent of the barren grounds on which this useless timber grows.

Q. Now, go further north to the wooded country, and tell us where the trees of economic value commence? A. All the branches of the Athabasca, and the Athabasca River itself, have excellent forests in many places, sometimes continuous for very many miles. Then at other times the forest is poor, and in some places nothing but small poplars. The whole region may be taken as a forest country that will produce economic timber. The same be said of the country up towards the base of the Rocky Mountains, at the source of Smoky River and the various branches coming from the south that flow into the Peace River, the height of land between the Saskatchewan and the Beaver River produces excellent timber; and there are immense groves and timber of excellent quality lying between Prince Albert and Green Lake. I am speaking now from actual observation. Very excellent groves of white and black spruce are found in that country. Of course when I speak of timber, I mention only black and white spruce and jack pine as we call it—that is a scrub pine, only it grows very

large up there. These are the trees that are of economic value, besides the balsam poplar, and it only grows on the islands and alluvial bonds along the river bottoms. The aspen never grows large; it seldom runs above a foot in diameter in the Peace River country, although I have seen specimens larger than that. I would not speak of the aspen as a tree of economic value for the purposes of export. I saw numbers of poplars on the islands and along the rivers over seven feet in diameter. As soon as I pass into the Laurentian country, whether forest or not, I pass to a region of low growth, little trees of no value except an occasional clump of trees along the margin of the streams where there is alluvial soil; but the general character of the timber in the Laurentian country lying east of Lake Athabasca and Great Slave Lake, up to the borders of the forests of the barren grounds is that it has no economic value except for firewood. On the low grounds, and along the rivers and near lakes sometimes the trees there attain considerable dimensions.

By Honorable Mr. Turner :

Q. What is your experience in going along the river banks: where are the trees usually to be found, on the northern exposure or the southern exposure? A. That depends. If you are south the trees are all on the northern exposure; that is they are on the south bank of the river.

Q. Supposing you were advising a man to plant trees that were rather difficult to raise in that country, if he had a choice, what exposure would you ask him to plant them in? A. Your first question was properly answered. Your second question is not of the same character and must be answered differently. I would put them if the climatic conditions were thought to be unfavorable on account of the cold, I would put them on a northern exposure more than I would on a southern one. The difficulty in raising trees in the North-West is not the killing of the buds, but it is the killing of the trunks, and the trunk of the tree is killed in this way: it is frozen solid. We know that the power of the sun is wonderful: when the tree is frozen the action of the sun on the southern side has a tendency to cause the sap to expand and gather as it were, at night it freezes again, and eventually lifts the bark from the tree, and as soon as it does that the trunk dries and the bark withers and the tree is killed. Hence, all trees that are weak in the trunk are destroyed not by the action of the frost, but by the combined actions of sun and frost in the North-West.

Q. Then your advice to a man planting trees would be to give them a northern exposure? A. Yes, and the above answer is my reason for doing it.

Q. What eastern fruits, including the apple, is there a possibility of growing from the Red River to the Rockies, and how far northward may these growths be expected to extend? A. Apple trees will succeed eventually in every part of the North-West Territories and far northward. The first thing to be done is to grow seedlings whose stems will stand the action of the winter in the localities where they are going to be permanently grown—in other words, no imported trees at the present time are safe to be taken into Manitoba or any part of the North-West. As soon as a variety or varieties have been grown from seed, whose trunks will not be injured by the combined action of the sun and frost in the winter, then we can graft the finer kinds of apples upon those; for it is not the branches that is injured by the frosts, but the stem. They raise apples in abundance for export at Hazan, in Russia. This province has a climate precisely like ours as far north as latitude 56° which would take us up to Dunvegan on Peace River, so that the time is coming when apples will grow on the whole of the region as far north as Fort Liard; for the winter temperature of the northern sections is not so severe in connection with fruit trees as it is on the exposed prairies. At the meeting of the Fruit Growers' Association, two months since, I told Mr. Gibbs, of Abbotsford, near Montreal, that we would both live to see the day when grapes would be grown in immense quantities at Medicine Hat, in the North-West Territories, and the reason is, the climate there is dry and warm, and by growing the vines close to the ground so as to get the radiated heat as well as the direct heat, they can ripen grapes there earlier than in the beautiful city of Ottawa. There is no doubt of it whatever.

By the Chairman :

Q. Speaking of the buffalo, the original habitat of the buffalo, you are aware, that the DeSoto found them down near the mouth of the Mississippi River. They are known to extend you say to the plains of Peace River. Mr. MacLean, of Lower Fort Garry, in his communication read yesterday, mentioned to us that he has found them down the Liard River. Now, is that because there is an open country extending up through to there? A. No doubt about it. It is prairie and copse wood which extends all the way. We know little of it north of the Liard River, but it extends to it. Wherever there is copse wood and prairie, there were the buffalo in the past.

Q. Can you say to us that there will be domestic animals in the future in that vast region? A. Most decidedly, and the sheep and the pigs and the cattle and the horses of the future will be, no doubt at all, raised on those upper plains. It is a law of nature that they cannot fatten cattle in southern Texas. Why? Because it is not cold enough to solidify the fat as it were, and they have got to come north to fatten. There is no getting round the fact that every animal, as you go north produces more fat, and is easier fattened; because it is a law of nature that fat should be laid up. So that when you speak of fat cattle and fat hogs and fat things of the future you will get them to the north.

The Committee adjourned at 1 o'clock.

SENATE COMMITTEE ROOM, OTTAWA, 27th April, 1888.

The following letters were read :—

VICTORIA, B. C., 20th April, 1888.

MY DEAR SIR,—I have looked over the enquiries about the resources of the Mackenzie Basin and do not see that I can furnish any practical information about it, having never been further north than Athabasca Lake, and that only in summer.

Out of respect to you, however, and the compliment implied in asking me to aid your Committee I cannot refrain from writing you these few lines.

I would suggest your getting hold of a copy of the work and maps of the Rev. Father Petitot published by the French Academy in Paris, as containing a solution of many of the aforesaid enquiries.

Yours very truly,

JAS. A. GRAHAME.

HON. JOHN SCHULTZ, the Senate, Ottawa.

MERCURISTON, ELPHINSTONE P. O.,

MANITOBA, 16th April, 1888.

DEAR SIR,—I have just seen in the *Free Press* reference made to your speech about the "Far North-West," and but for the sad fact that my journals were burnt at — line fire, I might fancy that you had got a leaf out of them. As I was for twenty years in Mackenzie River district and know all within its boundaries, and for fifteen years of that time I was employed exploring in the Rocky Mountains, the Stikkeen and the mighty Pelly or Campbell Yukon River passing through Lower Alaska, thus I was the first white man that explored over that vast region, and which I got duly entered on the map of the world and knowledges of the people. You may rest assured that I was not during that period of time in a band box, free from peril, and enjoying all the comforts of life. It was the other way, all peril and hardship pushing for the front.

I may mention that I was for several years in charge of Athabasca district, including Peace River.

From my long connection with and the interest I shall ever feel in the far North-West's success and welfare, I hope you will kindly pardon this intrusion.

Believe me yours truly,

ROBERT CAMPBELL.

Hon. J. C. SCHULTZ, Senator, Ottawa.

DEPARTMENT OF INDIAN AFFAIRS, OTTAWA, 11th April, 1888.

MY DEAR SENATOR SCHULTZ,—In reply to your note of the 31st ultimo, I regret to state that we have very little information in this Department respecting Indians outside of treaty limits. I have, however, succeeded in finding some tabulated statements which may be of service to your Honorable Committee, one of which is dated, you will observe, in October, 1882, and purports to be a list of persons then composing the population of Athabasca district entitled to participation in any lands that might be granted by the Government to the natives of the North-West Territories. The other is dated in April, 1884, and purports to be a census of the white inhabitants of that country; but, I find on looking over it, that there are Indians, half-breeds and Requimaux included therein. I also forward a copy of a letter from Bishop Bompas addressed to the Secretary of the Governor of the North-West Territories, at Battleford, and dated at Fort Chippewyan, Athabasca Lake, the 12th August, 1880, which contains considerable information in regard to the resources of the country and the natives, &c.

The other documents in the Department respecting the Indians outside of treaty limits consist merely of short petitions signed by a few of them asking the Government to make a treaty with them and contain no information in regard to matters that would be of importance for your Committee.

Believe me to be, my dear Senator Schultz, yours very sincerely,

L. VANKOUGHNET,

Deputy Superintendent General of Indian Affairs.

CENSUS of White Population in Athabaska River District (62 Families).

SUMMARY.

	Men.	Women.
Adults	61	63
Children	109	100
	170	163
Grand Total Souls.	333	

RECAPITULATION of Census of White Population in Mackenzie River District.

	Men.	Women.	Boys.	Girls.	Total.
Rampart House.....	2	1	1	2	6
Peel's River, La Pierre's House.....	11	6	12	9	38
Forts—					
Good Hope.....	8	4	6	8	26
Norman.....	2	2	1	4	9
Liard.....	7	4	4	5	20
Nelson.....	5	3	5	3	16
Simpson.....	14	6	9	10	39
Providence.....	13	14	8	7	42
Rae.....	8	4	8	6	26
Big Island.....	5	4	9	8	26
Total.....	75	48	63	61	246

R. & O. E.

R. MACFARLANE.

FORT CHIFFEWYAN, ATHABASCA, N.W.T.,
1st October, 1882.

FORT CHIFFEWYAN, ATHABASCA LAKE, 12th August, 1880.

SIR,—An informal intimation having been received by me that an application for some Government aid towards the development of this region or the improvement of its inhabitants might receive attention, I venture to convey to you some suggestions as to how, in my view, the Government might most favorably take action with these objects.

The efforts desirable to be made at the present time seem to be chiefly two: 1st. The raising of provisions from the soil on the Peace and Liard Rivers, where the conditions are favorable to agriculture; and 2nd. The placing of steam on the Mackenzie River—both these objects might I think be deemed within the sphere of the Government aid, for reasons which I beg leave briefly to refer to.

1. As to the farms. Provisions throughout the Athabasca and Mackenzie districts of the North-West Territories appear to become gradually more scarce and precarious, the wild animals being in the course of events less plentiful than formerly; the Indians are therefore in some danger of starvation, unless taught the art of cultivating the soil, and how to do this they can be shown only by example.

Besides the natives the only residents in the country are the fur companies' agents and the missionaries. Of these the former have little interest in promoting the cultivation of the northern part of the Territories, as it is rather their policy to retain it as a fur reserve. The missionaries fear to devote too much attention to the secular pursuits of agriculture, as their funds and employments are intended for religious objects.

If the Government should think fit to assist in this matter in the interest of the native tribes, and of the development of the country generally, I should recommend that this be attempted by the appointment of two Government industrial agents, one for the Peace River and one for Liard, at a moderate salary, with a limited supply of farming implements, and that practical Canadian farmers be selected for this post.

Such an appointment would exhibit the regard of the Government for the welfare of the country more than the appointment of magistrates or police, or any agents having more directly the character of a ruler. The expense would be but trifling and the advantage great.

The duty of the agents would be to establish farms on the two rivers named, and by this example to encourage the Indians to do the same. The produce of the farms would admit of Indian children being gathered together for schooling, which scarcity of provision at present forbids, and the result of the effort might (D. V.) be the settling of the whole country on a solid basis of civilization and advancement.

It will be observed that I do not apply for Government money to be granted for this purpose to private individuals, as I think it would be more satisfactory for the Government to commence the effort themselves, and they would be at liberty to relinquish or transfer it as soon as the objects in view had been so far attained that they might be safely left to private enterprise.

A moderate farm on the Liard River could supply with flour in time of dearth any part of Mackenzie River and a farm on Peace River the same in Athabasca District. The conditions for agriculture are probably about equally favorable in each case. The Peace River is at present especially a starving district though with capabilities that may fit it for becoming the granary of a large country, but the Government have already received a sufficiency of reports concerning its soil. The past winter the starving Indians on Peace River have been stealing and eating horses, and two of them are said to have killed and eaten children.

2. Regarding the other object of placing steam on the Mackenzie it should be stated that the stream of the Mackenzie including the Peace and Slave Rivers, which flow into it is the largest river in the Queen's Dominions and second only to the Mississippi in the United States. It becomes a question how far it is consistent with the national honor and the glory of Her Majesty and the British Empire to allow this magnificent stream to be navigated by only a few barges when in the neighboring territory of the United States most inconsiderable streams are traversed by steamers.

The Mackenzie is navigable for steamers for about 1,300 miles from its mouth, and the channels at its mouth have been correctly laid down on the Admiralty charts. It is suggested that application might be made to the Imperial Government to allow a vessel of the Pacific fleet to cruise as far as the north of Behring's Straits or Point Barrow and that from thence a gun boat or steam launch should be sent forward to mount the Mackenzie.

The Government might then think fit to leave the gun boat or steam launch in the Mackenzie for the encouragement of trade and private enterprise and the crew might return home through Canada.

It is said that Mr. Gordon Bennett, of New York, has sent his vessel to explore the mouth of the Mackenzie and it seems a pity that British vessels should be wholly absent from that region.

I have no expectation that any obstacle would be found in the way of a light draught steamer reaching the Mackenzie from Behring Straits, and I state this partly from personal inspection of the coast and also from the testimony of the natives.

The American whalers trade with the Esquimaux on the confines of British territory if not within it, and the Esquimaux obtain from them contraband liquors.

Americans appear also to be carrying on contraband trade from Alaska on British territory, but I do not know whether this includes liquor.

I am, sir, your obedient servant,

W. C. ATHABASCA,

(W. C. BOMPAS, D.D., Bishop of Athabasca.)

The Secretary of the Governor of the
North-West Territories, Battleford.

Answers from WILLIAM JAMES McLEAN, Chief Trader of the Hudson's Bay Company, Lower Fort Garry, Manitoba.

1st Question :—A. From the watershed of the Mackenzie River Basin at the height of land whence the Clearwater River takes its rise, down the aforesaid river to its confluence with the Athabasca River, thence down the Athabasca River to Lake Athabasca, and from there to Great Slave Lake down the Slave River, and on through that lake down the Mackenzie River to Fort Simpson, thence up the Liard River to Fort Liard, where I was stationed for ten years from 1863 to 1873.

The Liard River, the east branch of which takes its rise near the base of the Rocky Mountains, west of the Peace River, is or near latitude 56° north, and the west branch in the Rocky Mountains in or near the 58° of north latitude and confluent in or near latitude 60° north, and in or near longitude 121° west, flows due north and falls into the Mackenzie River at Fort Simpson in or near 64° north latitude. This river, though a considerable one, is augmented from the confluence of its east and west branches by several other small rivers on the east and west, is not intrinsically an easily navigated one, chiefly owing to its numerous sand bars which change their location frequently with the rise and fall of water, which like nearly all rivers flowing from the mountains, take place twice in nearly every navigable season, and will very much compare in this respect with the north branch of the Saskatchewan River. Eighteen miles above its confluence with the Mackenzie River there is a rapid of about three miles in length, where it runs through a deep bed of limestone, and which would impede navigation during low water.

The Mackenzie River.—On this river I cannot speak from personal knowledge from Fort Simpson downwards, but from Fort Simpson up to Great Slave Lake, a distance of about 150 miles, it is navigable for any reasonable sized craft. Before entering Great Slave Lake there is a considerable rapid, and though navigable, requires considerable power to ascend it.

Great Slave Lake.—This lake, though navigable, in its length of about 125 miles from the head of the Mackenzie River to the mouth of the Slave River is inconveniently wanting in harbors for any vessels of ordinary size.

The Slave River.—The river from its outlet in Slave Lake to the rapids at Fort Smith, a distance of about 150 miles, is navigable for steamers of light draught, and from above the rapids to Athabasca Lake, a distance of about 80 miles, is also navigable for similar vessels.

Lake Athabasca, from whence the Slave River flows to where the Athabasca River falls into it, is shallow, but deep enough to suit such vessels as can ply on the Slave and Athabasca Rivers. The navigation of the Athabasca River, from its outlet in Lake Athabasca to the confluence of the Clearwater River at Fort McMurray, a distance of about 180 miles, is very much obstructed with sand bars. I cannot speak with any authority of the Athabasca River above Fort McMurray.

The Clearwater River.—This river which has its rise at the height of land or watershed of the Mackenzie River Basin on the east, in latitude 56° north in or near 109° west longitude, is but a small river, but in seasons of good water is navigable for a distance of about 50 miles from its confluence with the Athabasca or up to where it is obstructed with rapids and water falls, about 25 miles from the height of land, commonly known as Portage la Loche.

2nd Question :—A. Depth varies with the rise and fall of water. Of the velocity of the currents of these rivers I cannot say accurately. Such vessels as ply on the North Saskatchewan would be suitable for all the rivers mentioned, with the exception of the Clearwater River, which would require smaller steamers.

3rd Question :—A. From Edmonton to the lower end of the rapids on the Athabasca River below the Athabasca Landing, a distance of about 200 miles. It is to be feared, however, for many years to come, this would be out of the question on account of its expenses.

4th Question :—A. *Vide* No. 1.

5th Question :—A. I cannot speak with any authority on the lower part of the Mackenzie River, nor of the coast line along its outlets.

Latter part of 5th Question:—I think so, provided a channel of sufficient depth was found in any of its numerous outlets.

6th Question:—A. I cannot speak with authority of this part of the Athabasca River.

7th Question:—A. *Vide* remarks on No. 1.

8th Question:—A. *Vide* remarks on No. 1.

9th Question:—A. *Vide* remarks on No. 1.

10th Question:—A. I cannot give any information regarding the Peace River, never having travelled on it.

11th Question:—A. I cannot speak from any knowledge of my own or from information gathered from others concerning these rivers.

12th Question:—A. *Vide* remarks on No. 1.

13th Question:—A. I cannot speak with any knowledge of the mines and timber in the vicinity of this lake. Fish is reported scarce of late years. I know of no other products which are available.

14th Question:—A. Of the mines and timber in the vicinity of this lake I know nothing. Fish is plentiful.

15th Question:—A. The same remarks apply here as to No. 14.

16th Question:—A. I do not know of any.

17th Question:—A. I cannot speak of the depth of water at the mouth of the Mackenzie River, but believe that sea-going steamers would ascend its whole length, from 1st of July to 1st of October.

18th Question. I have never seen the Hudson Bay Company's steamers plying on the rivers but believe they are somewhat similar to those on the Saskatchewan. They have been built since I left there.

19th Question:—A. No.

20th Question:—A. I cannot say.

21st Question:—A. Cannot give this, no record having been kept during my stay in these parts.

22nd Question:—A. Cannot give any positive information regarding this at the different points mentioned as it varies, but at Fort Liard where I was stationed during the winter seasons the average would be about four feet.

23rd Question:—A. I cannot think of anything which the Committee has overlooked.

24th Question:—A. I know of no portion of the country I have travelled and referred to in No. 1, of series A, that is alluvial; the country generally speaking is interspersed with swamps and muskegs. Portions of the soil along the Clearwater River are sandy and rocky and the Athabasca is somewhat similar. The Slave River is also sandy and rocky in the vicinity of the portages at Fort Smith. Along the Mackenzie the soil is light, and the same may be said of the Liard with little exception.

25th Question:—A. I cannot speak of the nature of these regions as I have never been there.

26th Question:—A. Potatoes and barley have been grown as far north as Fort Simpson to my knowledge, but do not think that such has been the case with any success further north.

27th Question:—A. I do not believe that wheat has been grown with any success north of the Peace River.

28th Question:—A. Cannot say. I tried it at Fort Liard, but with poor success.

29th Question:—A. At Fort Liard I planted potatoes and barley generally about the 10th May, and reaped barley about the 20th August, and potatoes were fit for use about that time, but were generally taken out of the ground about the 20th September.

30th Question:—About the 25th May at Fort Liard, and 10th June at Fort Simpson. Cannot state the season at any other points, not having had an opportunity to observe.

31st Question:—A. About ten days.

32nd Question:—A. Barley, as stated in No. 29.

Potatoes, as stated in No. 29.

Turnips, as stated in No. 29.

Indian corn did not succeed.

Strawberries, about the first week in July.

Gooseberries, about the first of August.

Other small fruit range from middle of July to the 10th August.

33rd Question:—A. Generally very hot with occasional thunder storms and rains. The nights are generally cold.

34th Question:—A. Occasionally.

35th Question:—A. Local.

36th Question:—A. Cannot say.

37th Question:—A. About the first of May.

38th Question:—A. Disagreeable generally. Snow falls in both months and lies on the ground as a rule from the 10th October.

39th Question:—A. I cannot say.

40th Question:—There is no comparison, the grasses in the north being very coarse, mostly comprised of swamp grass.

41st Question:—A. At Fort Liard, to my knowledge, and not there to any extent.

42nd Question:—A. I know of none.

43rd Question:—A. *Vide* No. 24.

44th Question:—A. Forts McMurray, Chippewyan, Resolution, Simpson and Liard grow good barley. As to the pasturage area, I am unable to say, but believe there is very little. Suitable ground for growing cereals is, however, scarce.

45th Question:—A. Climate is severe in winter, cannot say its effects upon plants. Such plants as are found there are of a hardy species.

46th Question:—A. Cannot say that there are any but the mayfly and grub, which are troublesome during some seasons.

47th Question:—A. I have no records. At Liard the climate does not differ to any great extent to that of Manitoba. This probably arises from the effect of the Chinook winds, which are only local.

48th Question:—A. Cannot say that they do. The Liard generally freezes about the middle of October and opens about the 8th May. The Mackenzie freezes about the 10th October and breaks up about the first of June.

49th Question:—A. There is no peculiarity about the winds, more than in any other part of the North-West.

At Fort Liard the Chinook winds are frequently felt during the winter season.

50th Question:—A. *Vide* No. 49.

51st Question:—A. Crops have been grown on the portions mentioned with fair results. Stock raising has not been tried to my knowledge. I do not think it suitable for that kind of farming.

52nd Question:—A. I cannot say positively, but do not think there are any.

53rd Question:—A. The two first named animals only find food there in the summer season, and they resort to the wooded country in winter. Cannot give a fair comparison of the musk ox, but think it will weigh from 300 to 400 pounds. Caribou weigh from 60 to 100. Cannot describe the habits of these animals beyond their migration—north in spring and south in autumn. Elk is to be found on the Athabasca and Hay Rivers. The latter flows from Slave Lake on the south. Moose is to be found in all the region mentioned but is becoming scarce of late years. Wood buffalo are to be found in small numbers on the Athabasca and regions west of it, to my knowledge as far west as Fort Liard. These animals weigh from 500 to 800 lbs. each, and their robes, as well as those of the caribou and musk ox, are of great use to the natives in affording them covering during the winter season.

54th Question:—A. Lynx: Cannot say as they fluctuate very much. Arctic fox, black fox and silver fox—Very scarce, and can only be caught with steel traps. Breed once a year and are of the same family as the red and cross foxes. Cross fox

and red fox—The above applies here to habits, but not so scarce as the silver and black foxes. Fisher—Not found generally north of Slave Lake; breed once a year and are scarce. Wolverine—To be found throughout the region referred to, and is also scarce. Otter—The otter is to be found in nearly all these regions of the Mackenzie River Basin, but very few in the northern portion. Beaver—This animal is to be found throughout the region mentioned, and affords food and raiment to the natives. Martin—Ditto. Mink—To be found, but scarce in the northern part of the country mentioned. Ermine and Musk rat—Ditto. Polar bear—To be found only on the coast. Grizzly—To be found on the Athabasca and west of the Rocky Mountains. Black—To be found all over the region mentioned as far north as the barren ground. Cinnamon bear—Ditto.

55th Question:—A. I have no opportunity of knowing this.

57th Question:—A. Whitefish, jackfish or pike, doré, pickerel, methey or loche, in all the waters mentioned. In addition to those mentioned there is also to be found in the Mackenzie River, salmon or unknown fish and bluefish. Size varies in the different lakes and rivers. The whitefish will compare with that of Lakes Winnipeg and Manitoba. The Mackenzie River salmon will weigh from 15 to 25 pounds, even more, and is to be found also in Great Slave Lake and the Liard River. The bluefish will weigh about 2 pounds each. Taken with nets, and from what I can learn are diminishing in number lately.

58th Question:—A. I have no knowledge as regards the question.

59th Question:—A. I cannot speak with authority on this paragraph.

60th Question:—A. Yes; if it is possible to build them of spruce and birch.

61st Question:—A. I have none to give.

62nd Question:—A. Spruce, birch and tamarac are the only trees of any value in these regions. The size will compare favorably with such trees as are utilized for the manufacture of lumber in Manitoba. There is a large quantity on the Athabasca, Mackenzie and Liard Rivers. Cannot say as to the best outlet.

63rd Question:—A. Yes. Throughout the regions of the Mackenzie River Basin. Quantity considerable in good seasons. Quality first class.

64th Question:—A. No.

65th Question:—A. All over the region mentioned and is used but very little.

66th Question:—A. Poor

67th Question:—A. Gold. On the Liard, cannot say to what extent exported. That route used by the Hudson Bay Company. Silver—I know of none. Copper—I know of none. Iron—I know of none. Sulphur—In the Clearwater River; cannot say to what extent. Salt—Below Fort Smith on the Salt River; in fair quantity. Petroleum—On the north of Great Slave Lake; cannot say to what extent or value. Asphaltum—On the Athabasca River. Cannot say in what quantities. Gypsum—I know of none. Alum—I know of none. Precious stones—I know of none. Coal—On the Athabasca and west branch of the Liard. Lignite—On the Athabasca and west branch of the Liard. Plumbago—I know of none. Lead—I know of none.

68th Question:—A. Not in a position to say with authority.

69th Question:—A. I have nothing more to give. "NOTE." Sorry I have none to send.

70th Question:—A. All kinds of ducks and grey geese hatch all over the region referred to, grey and white waxies, swans and cranes go in large numbers to hatch along the coast. Generally arrive about the beginning of May and leave about the beginning of October. Time of hatching in June.

71st Question:—A. Geese, ducks, swans, cranes and waxies are all valuable as an article of food, and are some years in considerable numbers.

72nd Question:—A. Yes; in various places, chiefly around Lake Athabasca and Great Slave Lake.

73rd Question:—A. Roots of grasses and weeds, flies, &c.

74th Question:—A. I cannot say positively excepting at Liard where they arrived about the first week in May and left about the middle of October or earlier, according to the season.

75th Question :—A. Same as mentioned in No. 73, so far as I know.

76th Question :—A. Strawberries, raspberries, gooseberries, blueberries, cranberries, yellowberries, mooseberries, crowberries, highbush cranberries and a few others of minor value.

77th Question :—A. Cannot say ; but should think so.

78th Question :—A. Cannot say, it not being tested to my knowledge.

79th Question :—A. By rail. *Vide* No. 8.

80th Question :—A. I am not in a position to state this with any accuracy.

81st Question :—I cannot say.

Professor MACOEN re-called and his examination continued.

By Honorable Mr. Girard :

Q. Have you remarked any new kinds of ducks or geese or other birds that are not found in other parts of the Dominion, which are peculiar to that region? A. They are all found in certain parts of the Dominion and of the United States at times. They go there to rest, but in the northern region they come to live.

Q. Have you found any wild pigeons? A. I have not mentioned the wild pigeon in this list, because it has become so scarce now that it is of no value.

Q. But it is found there? A. Yes; it is there, but not worth while mentioning. I did not enumerate all the birds of the region, but just those that are valuable for food.

By Honorable Mr. Turner :

Q. Could you say that the wild pigeon is found there to a limited extent? A. Yes; and if you choose I will include twenty or thirty other birds that are considered of some value.

Q. But you have headed this a list of food birds? A. Yes.

Q. Have you the ordinary blackbird there? A. Yes. Indeed there are too many of them; they are going to be a nuisance up there.

Q. I suppose all the birds you have mentioned are migratory? A. Those that can get their food in the winter stay, but no other kind of bird remains there through the winter.

By Honorable Mr. Kaulbach :

Q. Does not the grouse remain there all winter? A. They come to the wooded country. In a sense none of the grouse family migrate. They move up and down the country as the ptarmigans do, but they do not leave it. For instance, the willow ptarmigan of the Province of Quebec comes down in the winter near to Quebec, but as the spring approaches it moves northward to breed. It comes down and remains over winter and goes back again, so that the grouse, in a sense, is a resident of the country.

By the Chairman :

Q. I see you have not given a list of the sea animals? A. I left those out on purpose, for the simple reason that I was not instructed to enumerate them, and I did not pay any attention to them.

Q. Is the tea plant of that country as a rule used for tea? A. No; they use it like the rest of us, when they cannot help themselves.

Q. Did you ever have to use it? A. Yes.

Q. Is it a substitute for tea? A. It is in an aromatic sense. It is highly aromatic, both taken as a tea, chewing the leaves and even smelling them. It is a valuable plant in the north, for this reason, the Arctic hare feeds largely on it. The leaves are evergreen. It grows in bushes from Newfoundland right across the country to the Arctic and Pacific coasts. It is one of the most common plants in the north.

Q. It is valuable for animals if not for man? A. Yes. It is recorded that the Arctic hare will come up to where the ships are wintering to feed on the tea leaves,

so that it is possible the tea leaf may have in it something of the same taste as the Labrador tea.

By Honorable Mr. Almon :

Q. Do you get the Scotch heather in the north? A. It has never been found in Canada except on the Labrador coast and in Newfoundland, and perhaps it is indigenous there. Some people suppose it was planted, but there is no doubt that it is indigenous in Cape Breton.

Honorable Mr. SUTHERLAND—Labrador tea is found as far south as Winnipeg, in Manitoba.

Professor MACOUN—You can get it within half a mile of this city. It is found in all the tamarac swamps of Canada. It is common on the Island of Vancouver. In fact, it is common everywhere in swamps all over the country, but it extends north and becomes a true Arctic plant in the northern islands. It is green all the year round and has beautiful white flowers in the month of June.

By the Chairman :

Q. We would like to know something of the medicinal plants in use among the Indians? A. I do not think there are many that are used, though I could give you, if necessary, a list of perhaps fifty species that grow in that country which are used by us, but I find that the Indians do not use many.

Q. Do they use roots for medicine? A. They use some roots for medicine. I have found that to be the case on Lake Winnipegosis.

Q. Does blood root grow in that northern country? A. No.

Q. Does ginseng? A. No.

By Honorable Mr. Kaulbach :

Q. Does sarsaparilla? A. Yes. I can give you very easily a list of all the medicinal plants, as far as we know the range. I am sorry to say that we do not know as much of the natural history of that region as we ought. It is pretty hard to have to go to the books published before I was born to furnish some of the information that I give you to day.

By the Chairman :

Q. The Department of the Interior informed us that within the scope of our inquiry, there were 1,260,000 square miles; how much of that is known to scientific men? A. It would be hard to answer it in one sense, and yet not in another. The Peace River region is fairly known. I examined the Peace River from its source to Lake Athabasca, and made sections into the country from its banks so that I know it fairly well. Dr. Dawson in 1879, and his assistants, examined the region included between the Athabasca and Peace River up as far north as latitude 57. That is very well known through Dr. Dawson's reports. Then, the Beaver River country and Lac la Biche we know fairly well, because in 1879, Sir Charles Tupper, who was then Minister of Railways, sent exploring parties up through that section, and they reported on the country. With the exception of my own report, Dr. Dawson's report, and the reports of the gentlemen that explored there in 1879, we have got to fall back on reports published 60 years ago for all this northern country except what you got from Bishop Olt and some of the other gentlemen who have been examined here, so that you can say all we know is the Peace River region and the southern part of the waters that drain into Athabasca Lake and the western waters of the Churchill. This is all we really know; and really we only know it in parts. It is nonsense to think that I could go down the river 700 miles, spend a month on it, and tell you all about it, or that Dr. Dawson would spend two months in a region of immense extent and tell you all about it, but we can tell you much that is true.

By Honorable Mr. Turner :

Q. Are there any indications of coal or iron in the Mackenzie River Basin? A. Yes; there is not the slightest doubt whatever that the coal of the Belly River and the Bow River and the Saskatchewan extends away down I might say to the Arctic Sea. I was the first party that brought the coal from that country, and I took a great interest in it then—sixteen years ago. It is found near Little Slave Lake. I

crossed from Edmonton to the Peace River in 1872, and we saw coal seams 14 feet thick in the valley of the Pembina, a river that flows into the Athabasca.

By the Chairman :

Q. At what point? A. It is just at the crossing towards Lake St. Anne's. Then again we crossed the Athabasca River and struck through the country heading for the head of Little Slave Lake, and on a river called Swan River, which empties into Little Slave Lake, I found masses of coal lying on the river's banks in large blocks, fully as good as that used at Edmonton now and equally valuable. I am satisfied from what I saw of the coal on that river that it is equal in quality to that of Edmonton. About Dunvegan we got coal which we lit in our lamp and found to burn splendidly. When we put a few pieces of it together it burned very well, although the seam that we got there was thin, but since then better seams have been found, and there is no doubt at all that there is coal on the upper waters of the Peace. Anyone reading Sir John Richardson's works can see at once that there is coal on the Lower Mackenzie. There is coal all the way from the boundary to the north.

By Honorable Mr. Kaulbach :

Q. What about iron? A. The iron found in that country is brown hematite, it is not magnetite such as we have here, but more of the clay iron sort. It is found in some quantities in the lower prairie region, and we found it on the banks of the Peace River, only it is a question as to its value. At Edmonton I saw bog iron ore, but I am not prepared to say that the iron is in great quantities.

By the Chairman :

Q. Suppose a steamer could start from Victoria, pass through Behring's Straits and the Arctic Sea to the mouth of the Mackenzie and ascend the river to the Great Slave Lake, would that vessel have to take coal enough for the return trip, or could she depend upon the coal to be found in the Mackenzie country? A. There is no doubt at all that she could depend upon the coal of the Mackenzie, because all explorers speak of it, and I think next year you will be able to see that I am right from the report of Mr. McConnell, who is now in that region. There is no doubt at all that there is excellent coal on the lower Mackenzie.

Q. Is it your belief, from the information you have, that steamers could go round to the Mackenzie? A. Dr. Dawson proved to my satisfaction that they could. Since Dr. Dawson's statement I have read the American reports. They had a number of men stationed at Point Barrow, the most northern part of Alaska, for three winters, and the records show that the temperature rose in August to 47°. I say if the water at Point Barrow was 47°, I have no hesitancy in saying that there would be no difficulty in steamers passing to and fro from the mouth of the Mackenzie River round for two months of the year. I have no personal knowledge of it, but from what I have read if the water is 47°, it will take some time to cool it down to 28° when sea water will freeze.

By Honorable Mr. Kaulbach :

Q. Is there much tide there? A. No; hardly any tide.

LIST OF MAMMALS FOUND WITHIN THE BASIN OF THE MACKENZIE RIVER, SUBMITTED BY PROFESSOR MACOUN.

ORDER—UNGULATA.

1. Moose (*Alce Americanus*, Jardine)—Peace River and forest country generally.
2. Woodland caribou (*Rangifer Caribou*, Linn.)—A few in the Churchill River Basin.
3. Barren ground caribou (*Rangifer Groenlandica*, Linn.)—The whole Arctic region—woods in winter.
4. Red deer or wapiti (*Cervis Canadensis*, Erxl.)—Headwaters of the Athabasca and Peace Rivers.

5. *Aplocerus Montanus*, Ord. (Rocky Mountain goat)—Rocky Mountains, north to the Arctic circle.

6. *Ovis Montana*, Ouv. (mountain sheep)—Rocky Mountains, north to the Arctic circle.

7. *Ovibos moschatus*, Zimm. (Musk ox)—Barren grounds, never coming south of lat. 59°.

8. *Bos Americanus*, Gmel. (wood buffalo)—A few between the Athabasca and Peace Rivers about lat. 58°. Another herd on Salt River about lat. 60°.

ORDER—CARNIVORA (CHIEFLY FUR-BEARING ANIMALS).

9. *Lynx Canadensis*, Geoff. (Canada lynx)—Very plentiful in the forest region and where rabbits are numerous.

10. *Lupus occidentalis*, Rich. (grey wolf, black wolf and white wolf)—Abundant throughout the whole region under one form or color or another.

11. *Vulpes vulgaris*, Fleming (red fox, silver fox, or black fox and cross fox)—Very common in the wooded or forest country.

12. *Vulpes Lagopus*, Linn. (arctic fox, white fox or blue fox)—Barren grounds and Arctic islands.

13. *Gulo Luscus*, Sabine (wolverine)—Chiefly in the forest region.

14. *Mustela Pennanti*, Erxl (fisher)—Forest region everywhere.

15. *Mustela Americana*, Turton (pine marten, sable)—In all the forest region.

16. *Putorius vulgaris*, Linn. (weasel)—North to Great Slave Lake.

17. *Putorius ermineus*, Linn. (ermine)—Common in the southern sections.

18. *Putorius vison*, Brisson (mink)—Common.

19. *Mephitis Mephitis*, Shaw, (skunk)—North to Great Slave Lake.

20. *Taxidia Americana*, Schreb (badger)—In the south-western part.

21. *Lutra Canadensis*, Turton (otter)—Common very far north.

22. *Ursus Horribilis*, Ord (grizzly bear)—Rocky Mountain to lat. 57 deg.

23. *Ursus Arctos*, Rich. (barren ground bear)—Barren grounds.

24. *Ursus Americanus*, Pallas (black or cinnamon bear)—North to the limit of trees.

25. *Thalassarcos maritimus*, Linn (white bear)—Shores and islands of the Arctic Sea.

ORDER—PINNIPEDIA, WHALES AND SEALS.

26. *Odobenus rosmarus*, Malm (walrus)—Hudson Bay and north-westerly.

27. *Phoca vitulina*, Linn. (fresh water seal)—Hudson Bay.

28. *Phoca Fœtida*, Fabr. (ringed seal)—All around the northern coast.

29. *Phoca Groenlandica*, Fabr. (harp seal)—Chiefly in Hudson Bay.

30. *Erignathus barbatus*, Fabr. (bearded seal)—Hudson Bay and Arctic Islands.

31. *Cystophora cristata*, Erxl. (hooded seal)—Hudson Bay and Arctic Ocean.

ORDER RODENTIA (GNAWERS).

32. *Neotoma cinerea*, Baird (bushy-tailed rat)—Rocky mountains north to lat. 56 deg.

33. *Hesperomys leacopus*, Raf. (white-footed or deer mouse) north to the Arctic ocean.

34. *Eutamias rutilus*, Pallas (long-eared mouse)—Northward to the Arctic circle.

35. *Arvicola borealis*, Rich. (little northern meadow mouse)—Mackenzie River Valley.

36. *Arvicola Xanthognathus*, Leach (chestnut cheeked meadow mouse) Hudson's bay and westward.

37. *Arvicola Noveboracensis*, Rich. (sharp-nosed meadow mouse)—Rocky Mountains to lat. 55 deg.

38. *Myodes obensis*, Brants. (tawny Lemming)—Chiefly northward in the Mackenzie River Basin.

39. *Cuniculus torquatus*, Pallas (Hudson's Bay, Lemming)—Common along in the Arctic coast.
40. *Zapus Hudsonius*, Coues (jumping mouse)—Mackenzie River valley north to Fort Simpson.
41. *Fiber Zibethicus*, Linn. (muskrat)—North to the Arctic Ocean.
42. *Lepus Arcticus*, Leach (polar hare)—Barren grounds and Arctic islands.
43. *Lepus Americanus*, Erzl (common rabbit or hare)—Everywhere common in the forest country.
44. *Erithizon dorsatus*, Linn (Canada porcupine)—From Fort Churchill westward to Mackenzie River.
45. *Erithizon epixanthus*, Brandt (yellow-haired porcupine)—Rocky Mountains north to latitude 60 degrees.
46. *Lagomys princeps*, Rich. (little chief hare)—Rocky Mountains north to latitude 60 degrees.
47. *Castor fiber*, Linn (beaver)—Throughout the whole region to the northern limit of trees.
48. *Sciuropterus volucella*, Pallas (northern flying squirrel)—From Hudson Bay to the Great Slave Lake.
49. *Sciurus Hudsonius*, Pallas (red squirrel)—Common to the northern limit of trees.
50. *Tamias Asiaticus*, Gml. (northern chipmunk)—Northward to the Arctic circle.
51. *Tamias lateralis*, Say (Say's chipmunk)—Rocky Mountains to latitude 57 degrees.
52. *Spermophilus empetra*, Pallas (Parry's spermophile)—Barren grounds and Rocky Mountains.
53. *Arctomys monax*, Linn (woodchuck)—Forest country to latitude 62 degrees, Mackenzie Basin.
54. *Arctomys caligatus*, Eschsch (hoary marmot)—Rocky Mountains to the Arctic circle.

ORDER INSECTIVORA (MOLES AND SHREWS).

55. *Sorex Forsteri*, Rich. (Forster's shrew)—Throughout the forest regions to the Arctic circle.
56. *Sorex sphagnicola*, Coues (bog-shrew)—North to the Liard River.

ORDER CETACEA (WHALES).

1. *Balaena mysticetus* (bowhead whale)—Abundant west of Point Barrow and probably eastward.
2. *Rhæhianectes glaucus* (California grey whale)—Scarce off Arctic Alaska.
3. *Balaenoptera velifera* (fin-back whale)—Scarce off Arctic Alaska.
4. *Beluga catoden* (white whale)—Common off Arctic Alaska.

LIST OF THE FISHES KNOWN TO OCCUR IN THE MACKENZIE BASIN,
SUBMITTED BY PROFESSOR MACOUN.

1. *Perca Americana*, Schrank (common perch)—Upper waters of the Churchill.
2. *Stizostethium vitreum*, J. & C. (wall-eyed pike, doré, pickerel).
3. *Cottus cognatus*, Rich. (Bear Lake bull-head)—Bear Lake and other large lakes.
4. *Cottus polaris*, Sabine (Arctic bull head)—Gulf of Boothia. Many water-fowl feed on it.
5. *Cottus hexacornis*, Rich. (six-horned bull-head)—Small rivers near the Coppermine River.
6. *Cyprinus Hudsonius*, Grey (grey sucker)—Very common in nearly all rivers.
7. *Cyprinus Forsterianus*, Rich. (red sucker)—Very abundant, extending far to the north.

8. *Cyprinus Sueurii*, Rich. (the picconou)—Found with the two preceding species
 9. *Esox lucius*, Linn. (common pike, jackfish)—In all fresh waters to the Arctic Sea.
10. *Salmo salar*, Linn. (salmon)—Churchill Rivers and west coast of Hudson Bay.
 11. *Salmo Rossii*, Rich. (Ross' Arctic salmon)—Regent's Inlet and Boothia Felix.
 12. *Salmo Hearnii*, Rich. (Coppermine River salmon)—Abundant at the mouth of the Coppermine River.
 13. *Salmo alipes*, Rich. (long-finned char)—Small rivers north-east of Back's River.
 14. *Salmo nitidus*, Rich. (the amalook)—Rivers near Prince Regent's Inlet.
 15. *Salmo Hoodii*, Rich. (Hood's char)—Coppermine and other rivers.
 16. *Salmo fontinalis*, Mitchell (brook trout)—Abundant in streams and lakes.
 17. *Salmo Namaycush*, Pennant (lake trout)—Abundant in all large lakes and many rivers.
 18. *Salmo Mackenzii*, Rich. (*inconnu*)—Abundant in the Mackenzie and Great Slave Lake.
 19. *Salmo villosus*, Currier (capelin)—Very abundant at the mouth of Back's Great Fish River on sandy shoals, in Bathurst Inlet.
 20. *Salmo signifer*, Rich. (Back's greyling)—Arctic and mountain waters frequent.
 21. *Salmo thymalloides*, Rich. (lesser greyling)—Waters around Bear Lake and Coppermine River.
 22. *Coregonus albus*, Rich. (whitefish)—Abundant in all lakes and many rivers.
 23. *Coregonus tullibee*, Rich. (lesser whitefish)—With the preceding, but not so common.
 24. *Coregonus quadrilateralis*, Rich. (the round-fish)—Polar Sea and all rivers north of lat. 62°.
 25. *Coregonus lucidus*, Rich. (Bear Lake, herring, salmon)—Extremely abundant at Bear Lake.
 26. *Clupea harengus*, Linn. (common herring)—Bathurst Inlet; may be distinct from this species.
 27. *Gadus morrhua*, Linn. (cod-fish)—Cod-fish were purchased from the Esquimaux by Captain Sir James Ross that were caught on the west side of Boothia Peninsula. Larger fish were taken by the Esquimaux farther west in the autumn, near Cape Isabella.
 28. *Gadus Callarias*, Linn. (the dorse)—This fish is taken west of Boothia Peninsula.
 29. *Lota maculosa*, Cuv. (methy or ling)—Common in the northern lakes and rivers.
 30. *Pleuronectes stellatus*, Pallas (stellated flounder)—Arctic Sea, east of the Mackenzie River.
 31. *Pleuronectes glacialis* Pallas (?) (Arctic turbot)—Arctic Sea at Bathurst Inlet.
 32. *Hyodon chrysopsis*, Rich. (moon-eye)—Said to be abundant in the Athabasca.
- There are doubtless many other species of fish in the multitude of lakes and rivers throughout this immense district, but our knowledge is so restricted that we cannot speak definitely of them.

BIRDS BREEDING IN THE MACKENZIE RIVER BASIN, COMPILED BY PROF. MACOUN.

ORDER PYGOPODES.

- Oolymbus holboellii*, Reinh. (Hollboele's grebe).
 " *auritus*, Linn. (horned grebe).
Brinator imber, Gunn (loon).

- Brinator Adamsii*, Gray (yellow billed loon).
 " *pacifus*, Laur (Pacific loon)—Reported as occurring in Great Slave Lake.
Brinator lumme, Gunn (red throated loon).

ORDER LONGIPENNES.

Of this large order only such species are mentioned as are known to breed in the interior. Those breeding on the coast only are omitted.

- Larus argentatus Smithsonianus*, Coes (American herring gull).
 " *Delawarensis*, Ord. (ring billed gull).
 " *Franklinii*, Sw. & Rich. (Franklin's gull).
 " *Philadelphia*, Ord. (Bonaparte's gull).
Sterna hirundo, Linn. (common tern).
 " *paradisaea*, Brumm (Arctic tern).
Hydrochelidon nigra surinamensis, Gmel. (black tern).

ORDER STEGANOPODES.

- Pelecanus erythrorhynchos*, Gmel. (pelican).

ORDER ANSERES.

- Merganser serrator*, Linn. (red breasted merganser).
 " *Americanus*, Cass. (American merganser).
Lophodytes cucullatus, Linn. (hooded merganser).
Anas boschas, Linn. (mallard).
 " *strepera*, Linn. (gadwall).
 " *Americana*, Gmel. (baldpate widgeon).
 " *Carolinensis*, Gmel. (green winged teal).
 " *discors*, Linn. (blue winged teal).
Spatula clypeata, Linn. (shoveller).
Dafila acuta, Linn. (pintail).
Aythya Americana, Eyt. (redhead).
 " *vallisneria*, Wils (canvas-back).
 " *marila nearctica*, Stejn. (scamp duck).
 " *affinis*, Eyt. (lesser scamp duck).
 " *collaris*, Donor. (ring necked duck).
Clancionetta clangula Americana, Bonap. (golden-eye).
 " *islandica*, Gmel. (Barrow's golden-eye).
Charitonetta albeola, L. (buffalo-head).
Clangula hyemalis, L. (old squaw, tong-tailed duck).
Somateria dresseri, Sharpe (American eider).
 " *spectabilis* Linn. (king eider).
Oidemia Americana, S. W. Rich. (American scoter).
 " *deglandi*, Bonap. (white winged scoter).
 " *perspicillata*, Linn. (surf scoter).
Erismatura rubida, Wils. (ruddy duck).
Chen caerulesceus (blue goose).
 " *hyperborea nivalis*, Foist. (greater snow goose).
 " *Rosii*, Baird (Ross' snow goose).
Anser albifrons gambeli, Hartt (white fronted goose).
Branta canadensis, Linn. (Canada goose).
 " " *Hutchinsii*, S. W. Rich. (Hutchin's goose).
 " *aernicula*, Linn. (brant).
 " *nigricans*, Laws (?) (black brant).
Columbianus, Ord. (whistling swan).
trumpeter, Rich. (trumpeter swan).

ORDER HERODIONES.

- Botaarus lentiginosus*, Montag. (bittern).
Ardæ Herodias, Linn (great blue heron).

ORDER PALUDICOLÆ.

- Grus Americana*, Linn (whooping crane).
 " *Canadensis*, Linn (little brown crane).
Porzana Carolina, L., Sora (carolina rail).
Fulica Americana, Gmel. (American coot).

ORDER LIMICOLÆ.

- Crymophilus fulicarius*, Linn (red phalarope).
Phalaropus Lobatus, Lynn (northern phalarope).
Recurvirostra Americana, Gm. (avocet).
Gallinago delicata, Ord. (Wilson's snipe).
Micropalama himantopus, Bonap. (stilt sandpiper).
Tringa canutus, Linn. (knot).
 " *maculata*, Vieill (pectoral sandpiper).
 " *fuscicollis*, Vieill (white-rumped sandpiper).
 " *Bairdii*, Coues (Baird's sandpiper).
 " *minutilla*, Vieill (least sandpiper).
 " *Alpina pacifica*, Coues (red-backed sandpiper).
Erennetes pusillus, L. (semi-palmated sandpiper).
Calidris arenaria, Linn. (scaupling).
Limosa fedoa, Linn. (marbled god-wit).
 " *hemastica*, Linn. (Hudsonian god-wit).
Totanus melaroleucus, Gmel. (greater yellow-legs).
 " *flavipes*, Gmel. (yellow-legs).
 " *solitarius*, Wils. (solitary sandpiper).
Tryngites subruficollis, Vieill (buff-breasted sandpiper).
Actitis macularia, Linn. (spotted sandpiper).
Numenius Hudsonicus, Lath. (Hudsonian curlew).
Charadrius squatarola, Linn. (black-bellied plover).
 " *dominicus*, Mall. (golden plover).
Streptilas (Arenaria) interpres, Linn (turnstone).

ORDER GALLINÆ.

- Dendragapus Canadensis*, Linn. (Canada grouse).
 " *Franklinii*, Dougl. (Franklin's grouse).
Bonasa umbellus togato, L. (Canadian ruffed grouse).
Lagopus lagopus, Linn. (willow ptarmigan).
 " *ruprestris*, Linn. (rock ptarmigan).
Pediacetes phasianellus, Linn. (sharp-tailed grouse).

ORDER COLUMBÆ.

- Ectopistes migratorius*, Linn. (passenger pigeon).

ORDER RAPTORES.

- Circus Hudsonicus*, Linn. (marsh hawk).
Accipiter Cooperi, Bonap. (cooper's hawk).
 " *atricapillus*, Wils. (goshawk).
Aquila Chrysaetos, Linn. (golden eagle).
Haliaeetus leucocephalus, Lynn (bald eagle).
Falco islandius, Brehun (white gyrfalcon).

- Falco rusticolus gyrfalco*, Linn. (gyrfalcon).
 " *peregrinus anatum*, Bonap. (duck hawk).
 " *Columbarius*, Linn. (pigeon hawk).
 " *Richardsonii*, Ridge (Richardson's merlin).
 " *sparverius*, Linn. (sparrow hawk).
Pandion haliaetus Carolinensis, Gmel. (osprey).
Asio accipitrinus, Pall. (short-eared owl).
 " *Wilsonianum*, Less. (long-eared owl).
Ula cinerea, Gmel. (great grey owl).
Nyctala tengmalmii Richardsoni, Bonap. (Richardson's owl).
Bubo Virginianus Arcticus, Swains (Arctic horned owl).
Nyctea nyctea, Linn. (snowy owl).
Surnia ulula caparoch, Mull. (hawk owl).

ORDER COCCYGES.

- Ceryle alcyon*, Linn. (belted king-fisher).

ORDER PICOL.

- Dryobates villosus leucomelas*, Bodd. (northern hairy woodpecker).
 " *pubescens*, Linn. (downy woodpecker).
Picoides Arcticus, Swains (Arctic three-toed woodpecker).
 " *Americanus*, Brehun (three-toed woodpecker).
Geophloeus pileatus, Linn. (pileated woodpecker).
Colaptes auratus, Linn. (flicker, high-holder).

ORDER MACROCHVIRES.

- Chordeiles Virginianus*, Gmel. (night hawk).
Trochilus colubis, Linn. (ruby throated humming bird).

ORDER PASSERES.

- Contopus borealis*, Swains (olive-sided fly-catcher).
Empidonax flaviventris, Baird (yellow-bellied fly-catcher).
 " *pusillus*, Swains. (Little fly-catcher).
 " *trillii*, And. (Traill's fly-catcher).
 " *Minimus*, Baird (least fly-catcher).
 " *Hammondi*, Xanthus (Hammond's fly-catcher).
Otocoris alpestris, Linn. (horned lark).
Perisoreus canadensis, Linn. (Canada jay).
Corvus corax sinuatus, Wagh. (raven).
 " *Americanus*, And. (crow).
Agelaius phoeniceus, L. (red-winged blackbird).
Scolecophagus Carolinus, Mull. (rusty blackbird).
Coccothraustes vespertina, Coop. (evening grosbeak).
Pinicola enucleator, Linn. (pine grosbeak).
Loxia leucoptera, Gmel. (white-winged cross-bill).
Acanthis linaria, Linn. (red-poll).
Spinus tristis, Linn. (gold finch).
Spinus pinus, Wils. (pine finch).
Plectrophenax nivalis, Linn. (snow bunting).
Calcarius lapponicus, Linn. (Lapland longspur).
 " *pictus*, Swains. (Smith's longspur).
Zonotrichia leucophrys, Forst. (white-crowned sparrow).
 " *albicollis*, Gmel. (white-throated sparrow).
Spizella monticola, Gmel. (tree sparrow).
 " *socialis*, Wils. (chipping sparrow).
Junco hyemalis, Linn. (snow-bird).
Melospiza fasciata, Gmel. (song sparrow).

- Melospiza lincolni*, And. (Lincoln's sparrow).
 " *Georgiana*, Lath. (swamp sparrow).
Passerella iliaca, Mers. (fox sparrow).
Petrochelidon lunifrons, Gray (cliff swallow).
Chelidon erythrogaster, Bodd. (barn swallow).
Tachycineta bicolor, Vieill (white-bellied swallow).
Clivicola riparia, Linn. (bank swallow).
Ampelis cedrorum, Vieill (cedar bird).
Lanius borealis, Vieill (northern shrike).
Vireo olivaceus, Linn. (red-eyed vireo).
 " *gilvus*, Vieill (warbling vireo).
Miniotilta varia, Linn. (black and white warbler).
Helminthophila ruficapella, Wils. (Nashville warbler).
 " *celeta*, Gay (orange crowned warbler).
 " *pergrina*, Wils. (Tennessee warbler).
Dendroica carulescens, Gmel. (black throated blue warbler).
 " *coronata*, Linn. (myrtle warbler).
 " *maculosa*, Gmel. (magnolia warbler).
Striata, Forst. (black pole warbler).
 " *palmarum*, Gmel. (palm warbler).
Seiurus noveboracensis, Gmel. (water thrush).
Sylvania pusilla, Wils. (Wilson's warbler).
Setophaga ruticilla, Linn. (redstart).
Anthus Pennsylvanicus, Lath. (pipit, titlark.)
Sitta Canadensis, Linn. (red-breasted nuthatch).
Parus Hudsonicus, Forst. (Hudson's chickadee).
Regulus satrapa, Licht (golden crowned light. Golden crowned kniglet.)
 " *calendula*, Linn. (ruby-crowned kniglet.)
Turdus ustulatus swainsonii pallasii, Cab. (olive-backed thrush).
Merula migratoria, Linn. (robin).
 Without doubt there are many birds which breed in this region that have not been included in the above list. Only those species as to whose identity no reasonable doubt exists have been admitted.

LIST OF TREES IN THE MACKENZIE RIVER BASIN.

1. *Populus tremuloides*, Michx. (aspen)—On dry soil throughout the whole region
2. *Populus balsamifera*, Linn. (balsam poplar)—Chiefly on islands in the valleys of the great rivers of the region. This tree attains a great size in the valley of the Peace, Liard and Mackenzie Rivers:
3. *Pinus Banksiana*, Lambert (scrub pine)—Abundant on dry, sandy or rocky soil throughout the whole country, except the headwaters of the Athabasca and Peace Rivers, and extending north to the Arctic circle. This is the "red pine" spoken of by travellers. North of Carleton and in the valley of the Athabasca it is often found nearly two feet in diameter.
4. *Pinus Murrayana* (black or sugar pine)—Along the base of the Rocky Mountains at the head of the Peace and Athabasca Rivers and in northern British Columbia west of the mountains. Trees generally small.
5. *Picea alba*, Link. (white spruce)—This tree constitutes the bulk of the sub-arctic forest, and in the valleys of the rivers and other suitable localities attains a large size. This is the timber tree of the whole Mackenzie River Basin, both east and west of the Rocky Mountains.
- Picea nigra*, Link (black spruce)—With the preceding but a much smaller tree. It is generally in company with larch or tamarack.

8. *Abies balsamea*, Miller (Canada balsam fir)—Mixed with black and white spruce in the sub-arctic forest. Of little value for timber.

9. *Abies subalpina*, Engelm (mountain balsam)—In the Rocky mountains, and the more elevated foothills on the Athabasca and Peace Rivers.

10. *Larix Americana*, Michx. (tamarac)—Common in swamps and wet woods extending northward to near the Arctic circle. Timber seldom of any size.

11. *Betula papyrifera*, Michx. (canoe birch)—Generally abundant throughout the whole forest region, but seldom of large size owing to the demand for bark to make canoes. In the Mackenzie River Basin, the Indians and Half-breeds make large quantities of excellent syrup from the sap of this tree, but no sugar, as the syrup will not crystallize.

Dwarf birch, alders and willows are common everywhere and cover marshy tracts to the south in the barren grounds; they take the place of the spruce and other trees. Moose and cariboo feed on their leaves and twigs.

SENATE COMMITTEE ROOM,

OTTAWA, 10th April, 1888.

SIR,—I am requested by the Committee to ask your answers to the list of questions sent you by this mail, and also to ask you whether you are willing to be orally examined upon them after they are read to the Committee. I have also to request that you will particularly furnish to the Committee information regarding the navigation of the sea coast adjacent to the mouths of the Mackenzie River, and more particularly the sea coast westward to the Behring Straits. Also your opinion regarding the possible navigation by sea-going steamers passing through Behring Straits and through the Polar Sea to the mouths of the Mackenzie and up that river, giving all possible information regarding the sea animals and sea fish of that region, and your estimate of the possible trade accruing to Canada if the navigation of the Mackenzie is demonstrated for sea-going crafts and such navigation can be connected with Behring Straits. Your early answer to this communication will very much oblige.

I am, sir, yours very truly,

JOHN SCHULTZ,
Chairman.

J. B. HURLBERT, Esq., LL.D., Ottawa, Ont.

COMMUNICATION FROM J. B. HURLBERT, M.D., LL.D.

MACKENZIE'S DISCOVERY OF THE RIVER NOW BEARING HIS NAME.

Mackenzie's winter residence was at Fort Chippewyan, on the Athabasca Lake (latitude $58\frac{1}{2}^{\circ}$, and longitude 111° west). He started on the 3rd June, 1789, in a bark canoe with five men and two squaws, wives of two of these Indians and a small canoe under the charge of a Chippewyan chief and his two wives. He reached Great Slave Lake on the 9th June. Here he was delayed from various causes for 20 days. On the 27th he commenced the descent of this noble river, which he says has a course unbroken by rapids or falls of nearly 800 miles. He advanced so rapidly that on the 10th July he arrived at an Eskimo encampment. On the 12th July he came to the Arctic Sea, of which the Indians knew nothing except that on it the Eskimo killed large fish. The next day those large fishes, which proved to be whales, were seen disporting themselves, and Mackenzie ordered his canoe in pursuit. Having ventured beyond the islands he was overtaken in a storm and regained Whale Island with much difficulty. The tide was 18 inches. On the 16th July, 43 days after leaving Fort Chippewyan, he commenced his homeward voyage, and on the 12th

September reached his winter quarters at Fort Chippewyan, 191 days from his leaving. In 1825 Sir John Franklin went from Great Bear Lake down the Mackenzie River and west to Return Reef (lat. $70^{\circ} 43'$; long. $152^{\circ} 14'$ west.) Franklin expected to meet Captain Beechy in the "Blossom" at Point Barrow. Captain Beechy had entered Behring Straits, and by his boats had explored the coast considerably beyond "Icy Cape" of Captain Cook as far as Point Barrow (lat. $71^{\circ} 38'$, long. $156^{\circ} 15'$ west) 160 miles west of Return Reef, but Franklin and Beechy did not meet. Franklin reached Beechy Point, (long. 150° west) and the "Blossom" reached Icy Cape, and her boats one degree farther. On the first June, 1837, Thomas Simpson left Fort Chippewyan for Point Barrow, the most northerly part of North America, west of Mackenzie River (lat. 72° , long. 156°) in two small sea boats and a small luggage boat. He reached the ocean on the 9th July (lat. $68^{\circ} 49\frac{1}{2}'$, long. $136^{\circ} 37'$). On the 27th July, Thomas Simpson reached "Boat Extreme" (lat. $71^{\circ} 8'$, long. $154^{\circ} 26'$) where he left his boats and undertook to complete the journey on foot, some 28 or 29 miles to Point Barrow. The party consisted of five men. He reached Point Barrow on the 3rd August, 1837, and started on his return the next day. The land along the coast from Mackenzie River to Point Barrow was low and the water only from one to three fathoms in depth. The tides, semi-diurnal, 15 inches, coming from the west, and the bottom sandy or rocky. To the east the tides were only 8 to 9 inches. They crossed many salt creeks towards Point Barrow and many rivers of good size. The natives were well provided with seal skins and whalebone. Many whales were seen and seals everywhere, sporting in the ice. Reindeer were numerous. When he came to the coast which trended to the west the sea was free from ice, and the Eskimo told Simpson that the sea was open all along to the west. To the north many icebergs were seen and numerous whales and seals, and the Eskimo were well clothed in seal and reindeer skins. High water was from one to two o'clock a.m. and p.m. Driftwood was found at the mouth of the large rivers and pitch at places on shore. After his return, Simpson makes these remarks: "The sea was clear and navigable by ships during the summer months; the long, rolling swell which we encountered on our return and the view obtained from the mountains furnished tolerable proof of this. Reindeer, Arctic foxes, one or two kinds, seals, white owls, snow bunting, grouse and various well known species of water fowl were noticed." In 1825, Dr. Richardson with Mr. Kendall and five or six seamen were sent to examine the coast between Mackenzie River and Coppermine River. He reached the mouth of Coppermine River on the 8th August (lat. $67^{\circ} 58'$, long. $115^{\circ} 18'$ west). He found the tides at first not over 15 inches and further east 7 or 8 inches. The water along the shore was not more than two or three fathoms deep; the coast mostly low. He saw whales off the coast (lat. 71° , long. 129°), and at Cape Bathurst white whales and some black ones of a large size. The beach here was bold. July 19th, a thunder storm occurred. He passed bituminous shale cliffs on fire here as at other points of the coast. The air was hot from the burning shale and from it much alum had been formed. The interior seemed level, abounding in lakes; the soil clay, and tufts of beautiful floss were scattered over the waste. The reindeer were numerous. The sea abounds in moluscae and many black whales were again seen, also king ducks, eiders, snow birds, hawks and large moths. Many Eskimo huts were passed. The cliffs (lat. 70° , long. 125° west) were slate, clay and bituminous alum,—slate 600 feet high. We passed a river (lat. 70° , long. 125°) which we named "Wilmot Horton," filled with driftwood piled on the shores at its mouth, which seemed to prove that it flowed through a wooded country. July 26, 1826, bituminous shale again on fire. We found a nest of a snow bird with four young ones in it. The common killewake found in great numbers. Limestone cliffs seen day after day. The country at Lake Lyon (lat. 70° , long. 121°) presents a surface varied by gently swelling eminences covered with a grassy sward. The rocks were clay, slate and limestone, in nearly horizontal strata. Killed a deer. Saw large logs of drift timber. Temperature 35° to 50° Fahr. July 28th (lat. $69^{\circ} 20'$, long. $120^{\circ} 20'$), the tides had never been more than 18 inches, but here and at another place the sea wrack and lines of drift timber indicated a washing of the sea

to the height of 20 feet, probably from the north-west winds driving into funnel shaped bays. Soil—clay and limestone gravel. Tide—seven inches in the morning, eleven in the evening. Killed a fat reindeer. August 2nd—Thermometer 34° , usually 40° . Eskimo storehouses made of wood were noticed. Limestone rocks. Ducks were seen the size of the northern diver. Many deer were also seen (lat. $68^{\circ} 11'$, long. $114^{\circ} 54'$.) Thermometer 86° in the sun. 8th August—Reached the mouth of Copper Mine River (latitude $57^{\circ} 58'$, Long. $115^{\circ} 18'$) Dr. Richardson remarks that if a steamer were to run here fire-wood could be got on this coast sufficient for her daily consumption, and near Babage River, west of Mackenzie River, tertiary pitch coal exists of excellent quality in extensive beds. Dr. Richardson found 170 phænogamous plants, those having visible flowers. The cruces, bents (a wiry grass) and rushes constitute one-fifth of the whole number on the coast, and the grasses and bents cover more ground than all the rest of the vegetables. The cruciferous or crest-like tribe are one-seventh of the species, and the campana, bell like flowers, are nearly as numerous. The shrubby plants that reach the coast are the common juniper, two species of willow, dwarf birch (*betula glandulosa*) the common alder, the hippophae, the gooseberry, the red berry (*arbutus uva ursi*) Labrador tea, Lapland rose, (*Rhododendron lapponicum*), the bog whortleberry, a grey berry (*campetrum nigrum*), the kidney leaved oxyria grows in great abundance. Alpine bistort and some other plants, also white spruce fir, black spruce and canoe birch in sheltered places. The appearance of whales on the northern coast nearly midway between the nearest passage in Behring and Barrow Straits (lat. 74° , long. $80^{\circ} 90'$) upwards of a thousand miles distance from either, affords, Dr. Richardson says, subject for interesting speculation. Are there at all seasons large spaces of open water in the Arctic Seas, for whales must come to the surface to breathe, or do these animals travel from the Atlantic to the Pacific immediately on the breaking up of the ice off Cape Bathurst, (lat. 71° , long. 128°) and so early as the first of July? We lost them as we approached Coppermine River, and met with more ice. These were Arctic whales and would not go into southern seas.

Dr. Richardson started to ascend Coppermine River on the 9th August, 1826, and reached Fort Franklin, Great Bear Lake, on the 1st of September, having travelled by sea and land 1,980 miles in 71 days. In ascending Coppermine River, Dr. Richardson says, the first 40 miles were full of rapids flowing over uneven stony beds between precipitous rocks. The river is impracticable except for boats drawing a few inches, and then must be carried considerable distances. He took Col. Pasley's canvas boat but soon left it. The temperature at sunset was 62° . He saw small herds of reindeer, passed stunted spruce fir, and encamped 11th August among small pines (in lat. $67^{\circ} 33'$); saw many grey marmots. The *corvus canadensis* (whiskey jack) visited us. On the 13th we left Coppermine River to go direct for the north-east arm of Great Bear Lake. The rocks were old red sandstone, clay, slate and green stone. We passed scattered and thin clumps of pine; saw wolves in the mountains. Temperature was 53° . Sand flies were troublesome. 14th August—saw partridges (lat. $67^{\circ} 10'$) and met with wooded valleys. Saw much wood in the valleys far to the west. Bog whortle berries were found in abundance. From the height of land between Coppermine River and Great Bear Lake we had an extensive view of a lower and well wooded country. Walked fourteen miles that day. 16th August—Breakfasted in a convenient clump of wood and found a profusion of whortle berries. 17th August—Indians came laden with tongues, fat half dressed meat, and we killed two deer. There were pine trees in clumps on Dease River and the valley to the north was well wooded. We found whortle berries of a finer flavor than before. 18th August—Passed over rising ground covered with white spruce. 19th August—Made a raft of dry wood. Breakfasted on carp. 20th August.—Our nets yielded 17 pike, carp and whitefish. Eat the flesh of the musk ox, fat and juicy of a high musk flavor. 21st August—Our nets yielded 15 fish, enough for breakfast, and the Indians brought us meat and whortle berries. The height of Great Bear Lake above the sea

is about 200 feet. Chippewyan and Great Slave Lake have some portions of the bottom below the sea. We sounded Great Slave Lake with 65 fathom line (390 feet) without reaching the bottom. The length is 150 geographical miles, and the breadth 120 miles: or 172 and 138 statute miles. Its waters are transparent and of a blueish color like the great lakes of the St. Lawrence; its height above the Mackenzie at Fort Simpson is 150 feet.

Dr. Richardson met with wooded valleys and had fish and meat of the deer every day, occasionally partridges and musk ox one day. The temperature was 53° and 62° in the evening at sun-down.

I have examined the narratives of all the explorers of the coasts of the Arctic Sea from Behring Straits to the Mississippi or Churchill River, a distance of 3,000 or 4,000 miles, without following the sinuosities of the coast.

Behring Straits.—Deschnew, a Russian, sailed through Behring Straits in 1648, 81 years before Behring. Behring's first voyage was in 1729; his second in 1740. "The Blossom," Captain Beechy, in 1837, sailed through Behring Straits. The Admiralty surveying party surveyed from the straits to 350 miles east of the Mackenzie River. As far as 70 miles from the mouth of Mackenzie River the depths of the Arctic Ocean are given in fathoms at 12 to 35; from 10 to 20 miles from the shore, at two and three quarters to 15. Hershel Island (longitude 139 degrees), from 30 to 59, and at 60 miles from the shore at 69; ten miles from the shore 4 to 6; at Return Reef from three to four and a half; Beech Point (longitude 150 degrees) from one to four; Cape Halkett (longitude 152 degrees), three and half, and about the same to Behring Straits; Behring Straits, 22 to 55. The United States steamer "Rodgers" in 1881 (in latitude 73½ degrees, longitude 172 degrees west), 560 miles north of Behring Straits, found a depth from 24 to 27 fathoms. East of Mackenzie River, along the coast, from 3 to 6 fathoms, and at 6 to 70 miles from the shore, 18 to 29 fathoms. I have not found a record of any sea-going vessel going up Mackenzie River, but that the Arctic Ocean is open for several months in the summer we may infer from the testimony of Arctic explorers. The American whalers made voyages every year to the Arctic Ocean, off Mackenzie River, a quarter of a century ago. Franklin and Simpson found a heavy swell from the north indicating an open sea. Dr. Richardson inferred there was an open sea, from the whales in great numbers being in the sea, as they must come constantly to the surface to breathe. Commander Maguire passed through Behring Straits to Point Barrow. Captain Collinson was 50 miles off Mackenzie River.

Currents in the Arctic Ocean.—Drift wood was found on the shores of Spitzbergen thick as a mizen mast of a ship and 70 feet long. Some thrown up 16 to 18 feet. During summer the prevailing currents north of Spitzbergen and along its shores are from the north or north-east. Sir Edward Parry attained latitude 82 degrees 45' and found a southerly drift; saw drift wood in great abundance on the northern shores of Iceland. He thought it might come from the Obi or other large Russian rivers. In 1608 Henry Hudson, being north of the Goose Coast, was drifted northward. Dr. Kane says Mr. Morton's narrative, as to currents from the south-west, harmonizes with the observations of his party that the melted snow upon the rocks, the crowds of marine birds, the vegetable life and the rise of the thermometer in the water indicated a milder climate near the pole. "May it not be," he asks, "that the Gulf Stream traced to Nova Zembla (latitude 75 degrees) is deflected around the pole?" Mr. Morton found much grass beyond latitude 81. Commander Maguire in making his way north-east from Behring Straits to Point Barrow found his progress greatly aided by the current from Behring Straits. The current according to general testimony sets to the north. There is a strong current to the north in Behring Sea. The current sets eastward from Behring Sea to Coppermine River, say 2,000 miles. At 50 miles off Mackenzie River, Captain Collinson found the current so strong that with the boats going ahead he could not at times prevent his ship from being turned around; in Bellots Straits, McClintock had to contend with tides like a mill stream at the rate of seven miles an hour. The current from the west in the Gulf of Boothnia was four miles an hour. From the direction of the currents in the Polar

Seas. Arctic navigators have inferred that the tropical streams passing north-eastwards along the coasts of Norway and through Behring Straits, continue around the Arctic Ocean until their motion is spent and that the sea nearer the pole is an open sea. The currents, too, coming from the north in many parts of the Arctic, are warmer than the waters farther south.

Barren Grounds.—We have on the North American continent forests, prairies, and barren grounds, each of which has its peculiar physiognomical character. The forests extend from the Atlantic to the prairies. To the north and north-east of these woodlands are the barren grounds on the shores of Hudson Bay. These reach, says Sir John Richardson, from the 60th or 61st parallel to the extremity of the continent, but narrowing towards the north-westward. From the 92nd meridian its southern limit runs in a north-west direction to the 120th meridian at latitude 67 degrees to the northern shores of the Great Bear Lake. Further to the west the barren grounds form a border to the Arctic Sea of greater or less breadth, according to the northerly prolongation of the promontories. The southern limits throughout are nearly coincident with the Arctic circle, a little north of the isothermal of 63 for July, extending to Behring's Straits, but clumps of spruce-fir (the species Sir John Richardson says are doubtful), the usual outliers of the forests are found on the barren grounds, yet Sir John Richardson describes even these barren grounds as covered with a dense carpet of the *corneularis*, *tristis* and many other plants, a dozen at least, to the shores of the ocean. There are stumps of trees solitary and grouped, the size not named, and clumps of living trees on sheltered banks of rivers. On the sea coast even there is a good growth of grasses, twelve varieties are named, such as *elymus mollis*, *compacta* and several *poae*, varieties of our June grasses and the Kentucky blue grass. Hearne in his two expeditions, 1769-70, to discover Coppermine River, records fine weather from the 6th to the 9th November, and again in December 11th and 12th. He found deer plentiful; swans, geese and partridges; killed three musk oxen. He gives the following list of animals west of Hudson Bay in the barren grounds:—Foxes plentiful, of various colors which prey upon rabbits, mice and partridges; lynx, polar bear, black and grizzly bear, and wolverine as far north as Coppermine River. Otters plentiful to latitude 62, north of Churchill. Jackass, the lesser otter; common marten, ermine or stole, muskrat, porcupine, hares, numerous to latitude 72. Hearne names rabbits in another place. Squirrel plentiful in wooded parts. Ground squirrels plentiful to latitude 71, and large as the American grey squirrel. Mice, frogs and insects in great plenty. In Hudson and Arctic Sea are walrus or sea horse; the whole coast of the Hudson Bay being alive with them. Seal: more to the north, sea unicorns in the straits. Black whale, white whale and salmon numerous, some seasons, and kepling, shell fish; birds numerous. Eagles, several kinds, hawks of various sizes and plumage; owls, white, grey and mottled, ravens, American crows. Woodpeckers, grouse, buffalo grouse, sharp tailed grouse, wood partridge, willow partridge, rock partridge, red breasted thrush, grosbeak snow bunting, lapland finch, larks, titmouse, Hudson Bay black cap, swallows and martens, whooping crane, brown crane, bitterns, curlews to latitude 72, jacksnipes, red godwits, spotted godwits, sandpipers, plovers, hawk eye, sea pigeons, northern divers, black throated divers, white, grey and black gulls, black heads (gulls), pelicans, geese, eider ducks, dunter geese and ducks of various kinds.

Vegetables.—Gooseberries, cranberries, heath berries, currants, red and black, juniper berries, strawberries, eye berries, blueberries, partridge berries. Mosses, grasses of several kinds. Trees: pine, juniper, poplar, creeping birch, willow (dwarf); birch plentiful; pines, larch and poplar. Birch grow to great size further westward. Alder. Sir John Richardson says stumps of large trees are found and he saw large forests in the distance, but could not at that late season turn aside to examine them. The committee can judge from these statements whether the name "barren ground" is not a misnomer. It should at least be qualified. I know of no region of equal extent in any part of the globe similarly situated which is such a land of desolation as that part of the Dominion has been represented.

I may give a few facts in reference to climates further west. The summer is long enough and warm enough at Fort Norman, latitude 65 degrees, to ripen barley. The summer temperature at Fort Yukon, latitude 67, is 59 deg., 7 min. That of London, England, being 61, only one degree and three minutes higher. But the July at Fort Yukon is 65 deg., 7 min. and that of London 62 deg., 4 min., three degrees lower than Yukon. The mouth of the Mackenzie River, latitude 68 degrees, 49 min., is only one deg., 49 min. north of Yukon, and the summer of the shore of the Arctic Ocean is long enough for water fowl, as geese and ducks, which resort to it in enormous numbers, to pair, lay their eggs, hatch and allow the young time to feather sufficiently to fly south, which time could scarcely be less than five months. The summer at Fort Simpson, latitude 51-61, is 59 deg. and 5 min.

In Captain Back's narrative of 1833 to '35, in the barren grounds, in describing his discovery of Thlewee-choh, fish on Back's River, I find the statements that the laughing goose breeds on the coasts and islands of the Arctic Sea north of latitude 67 degrees (p. 505); that the snow goose breeds on the coast of the Arctic and on Melville Peninsula, latitude 67 deg. to 70 deg. In going north in the spring it reaches the 54th parallel on the 15th of April, the 57th parallel on the 25th of April and the 64th on the 20th of May, and its breeding station, in latitude 69 deg. by the beginning of June, and breeds in the Peninsula of Melville (lat. 67 to 70) and Boothnia (lat. 71 to 72 degrees). It lays three or four eggs (p. 516). The Brent goose is found on Parry's Island (lat. 74-75) (p. 518), and the musk ox in lat. 81.

Whales in the Arctic Sea.—White whales (*delphinapterous calodin*)—Arctic whales abound in Behring and Okhotsk Seas and ascend Yukon River 700 miles. They are 16 feet long and yield 80 to 100 gallons of oil, besides the more valuable head oil. Secondly, narwhals are abundant in the Arctic ocean; they are from 10 to 14 feet long, have a black tuck 8 to 10 feet long. Third, Greenland and bowhead or polar whale are found from Nova Zembla to the east coast of Siberia. An ice whale also found in Okhotsk Sea. There are four kinds; the first brown color, yields 200 barrels; the second black, 110; the third, 75; and the fourth, called poggy, 20 barrels. The bowhead are the most valuable of the whalebone whales, because it yields so large an amount of oil and whalebone; is more than 50 feet long. One caught, 45 feet long, yielded 60 barrels of oil and 1,050 lbs. of bone. The food of the bowhead is the floating animals called "right whale feed" or "brit," a winged pteropod mollusk flowing in great masses in the northern sea. Walrus are found in the Arctic north of Behring Straits as far north as ships have penetrated. One 12 feet 3 inches long, weight 2,250 lbs. The harp seal is an Arctic seal; the winged seal almost exclusively Arctic. The hooded seal is also an Arctic seal, found in Melville Bay, most northern part of Baffins Bay.

I have not found any record of salmon having been discovered either in the Arctic ocean or Mackenzie River unless the *inconnu*, the unknown fish, be a salmon. It has the habits of a salmon, resembles it in appearance, and descends the Mackenzie to the ocean. We know that the salmon is found in enormous numbers on the western shores of Hudson Bay, and in the rivers emptying into that bay. The Atlantic salmon too, ascend the St. Lawrence to the head of Lake Ontario and go up the rivers and small streams falling into that lake.

Answers from Dr. HURLBERT.

2nd Question:—A. I find from the accounts of Mackenzie, Richardson, Franklin, Simpson, &c., that the Mackenzie River is navigable from Great Slave Lake to the Arctic for large vessels more than 1,000 miles, and 1,200 to 1,300 from the rapids on Slave River. The Mackenzie, from Fort Simpson, is from two to three miles wide; current three or four miles an hour.

3rd Question:—A. Have no personal knowledge of the tributaries of the Mackenzie. A railway to connect Fort Simpson with the C. P. R. would give access to all the Mackenzie valley and to the Arctic Sea.

4th Question :—A. Sir J. Richardson gives the height of Great Bear Lake as 200 feet above the ocean; the fall to Mackenzie River 150 feet; its length 150 geographical (172 statute) miles, and its breadth 120 geographical (or 139 statute) miles. He tried to fathom Great Slave Lake, but a line 65 fathoms did not reach bottom. Great Slave and Athabasca Lakes have some portions of their bottoms like the great lakes of the St. Lawrence, below the level of the ocean. Steamers of any size could navigate these three lakes.

5th Question :—A. The Arctic sea coast was thoroughly explored from Point Barrow, and even from Behring Straits, to the mouth of Coppermine River by Franklin, Richardson, Simpson and others, a distance of 2,000 miles. The sea is shallow near the shore, two to three fathoms only. In my letter to the Committee I have given the depths from the Admiralty surveys. No harbors were found on all that coast. No definite information of the depth of water in the mouths of the Mackenzie River given in the explorers' reports; but the western outlet is well spoken of. In my written communication I have given facts to show that the Arctic Sea is probably open (except near the coast) the whole or most of the year. No doubt steamers from the head of the Mackenzie River at Fort Simpson, to its mouth, would find open water long enough to allow them to descend to the ocean, fish for two or three months and return. Small steamers would be best.

12th Question :—A. Vessels of large size can navigate Mackenzie River from Fort Simpson to its mouth (800 miles). The river is deep and the fall for the 800 miles about 50 feet, without rapids or falls.

13th Question :—A. 190 miles long and 30 wide, very deep. The surface 500 feet above the sea; some parts of the bottom below the level of the sea. Salt in great quantities which can be shovelled up; also gypsum; timber of good size on the south; abounds in fish, white fish and trout.

14th Question :—A. Great Slave Lake is also very deep water, transparent, and of a bluish color, like the water in the lakes of the St. Lawrence, same kind of fish as in Lake Athabasca.

15th Question :—A. Great Bear Lake, 170 miles long, 140 broad, very deep, 200 feet above the sea level; same kind of fish as in the Athabasca and Great Slave Lake and also a salmon—the inconnu.

17th Question :—A. Vessels of great size can ascend the Mackenzie River from inside the mouths—of these I have no definite information—from June until October according to the explorers' accounts.

19th Question :—A. I have given in my written account all I can gather from the explorers.

20th Question :—A. Rivers :—The Mississippi or Churchill. The Doobout emptying into Chesterfield Inlet, and several smaller ones.

Lakes :—Deer Lake, Wollaston, Doobout, and numerous smaller ones. Little is known of them.

21st Question :—A. Snow falls always light inland, in high latitudes; and not more than 3 feet in Mackenzie Valley. Rain, too, light in Mackenzie region, but heavier to the east and north-east of it.

22nd Question :—A. Have never seen any definite information, and give no credit to the reports.

24th Question :—A. The barren grounds, if there are any west of Hudson Bay, extend from 60 or 61 degrees, north latitude, skirting the shores of that bay and the Arctic coast to Behring Straits, lying north of the isothermal of 63 degrees for July marked on the larger map.

25th Question :—A. See my description of them in the written report.

26th Question :—A. The polar limits of the potato are beyond those of barley in Scandinavia. Turnips go to even a higher latitude than the potato. Barley at 70 degrees, north latitude, in Lapland; 67½ to 68 degrees in Northern Russia, and 68 degrees farther east. In the Mackenzie Valley it ripens well at Fort Norman, latitude 63 degrees, which is 400 miles north of the Orkneys and of Stockholm, the capital of Sweden, and 350 miles north of the capitals of Norway and Russia. It

ripens 5 degrees farther north than wheat. It will ripen in 90 days in these high latitudes.

27th Question:—A. In Norway wheat ripens as high as latitude 64 degrees, and in Sweden at 62 degrees, it falls to a lower latitude to the east. Sir J. Richardson says: "Wheat is grown with profit at 60½ degrees on Great Slave Lake, and Bishop Taché found it growing at latitude 62 degrees on the same lake. In the interior of the continents it will ripen in a summer temperature at 60 degrees with one month at 63 degrees. In England it ripens in a summer temperature of 60 degrees, and at Kasan in Russia (latitude 56°) at 60 degree 9'; on western coasts, as at Aberdeen, it ripens in a summer of 57 degrees with one month at 58 degrees. A summer of 60 degrees to 62 degrees is the most favorable climate.

28th Question:—A. Indian corn. Sir J. Franklin found it at latitude 54 degrees on the Saskatchewan and Macoun on the Peace River (latitude 56 degrees 12'). It will ripen in a summer of 65 degrees with one month at 67 degrees. It requires 7 months to ripen in its native climates, but has adapted itself to the shorter summers of the north, ripening in 60 days, but is exacting in requiring a high temperature—65 degrees (Fahrenheit) at least.

29th Question:—A. Early in May, 15th to 20th in Peace River. Indian corn later.

32nd Question:—A. Wheat, 100 days; barley, 90 days; rye, 90 days; oats, 100 days; potatoes, 100 to 120 days; turnips, 100 days; Indian corn, 60 to 90 days; strawberries early in June; Gooseberries later; raspberries in July; brambles in August.

33rd Question:—A. High temperature. Fort Simpson, latitude 62 degrees nearly; summer, 59½ degrees; July, 63 degrees. Lake Athabasca, July, 63 degrees. Peace River (Fort Vermillion) summer, 65 degrees; July, 67 degrees. Yukon (Fort) latitude 67 degrees, 59½ degrees; July, 65 degrees 7 minutes.

36th Question:—A. The effect of cultivation, and especially of under-draining, will make these localities less liable to frosts.

38th Question:—A. Generally fair with frosty nights.

39th Question:—A. Upon plants, annuals, sown in spring, the frosts of winter can have no effect, but those frosts pulverize the soil and prepare it for the seed.

40th Question:—A. Through all the country east of the great lakes of the Mackenzie River system, the grasses are like our June grass and the blue grass of Kentucky (*Poa compressa*). The prairie grasses have a most tenacious hold of the soil until broken up, and are then incapable of reproduction, and therefore not adapted to cultivation. The region of the cultivated grasses is identical with that of the summer rains, roughly sketched in the temperate zones by the presence of forests, hence the vast areas of the Western States are unfavorable for pastures and meadows. The Dominion embraces the chief pasture and meadow lands of North America, and these, with their accompanying flocks and herds, are of more importance than wheat lands.

41st Question:—A. Not in what has been called the barren grounds, at least I have found no mention of it, but grows in all the regions west to low down the Mackenzie Valley.

44th Question:—A. The entire area is fit for pasturage, as the native grasses grow over the whole country, even to the shores of the Hudson Bay and Arctic Ocean, and down the Mackenzie to the sea. All the regions in the valleys of the Mackenzie and its tributaries are fit for the production of the hardier grains, with the usual exception of mountainous regions and rocky and low, damp soils; but these are not large, the country being chiefly contained in the valleys of the great washes.

45th Question:—A. The climate is most favorable for the great staples of the temperate zone, not varying much from 60 to 67 degrees of Fahrenheit. The higher temperatures of the Western, Middle and South-Western States are destructive of these food plants, or very unfavorable for them. Hence the greater productiveness of all the grains, grasses, &c., and root crops in the middle and higher temperate zones. Our North-West Territories lie in the regions of summer rains

and moderate summer temperatures, in contrast to the deficient rains or none at all, and the higher temperatures, in the agricultural months, in the Territories and States to our south.

46th Question:—A. I have not found any record of such insects.

47th Question:—A. I have records of rain-fall and temperatures of many localities.

48th Question:—A. Yes; great. Of the North-West lakes I cannot speak from personal knowledge; but of the effects of lakes and rivers in Ontario and Quebec, I recollect many instances where the autumn frosts have been two and even three weeks earlier, inland, than near the lakes and rivers. In early summer, from the waters being still cool, they have not any visible effect.

49th Question:—A. The prevailing winds are south-west in summer except on the coasts of Hudson Bay and the Arctic. The Chinook winds are also from some point near the south-west. These winds are of course the cause of a milder climate towards the western coast.

51st Question:—A. Have given answers in other places to this question.

52nd Question:—A. In summer horned cattle and sheep would find very good pastures on the greater part of what is called the barren grounds.

53rd Question:—A. There are two kinds of caribou or reindeer. Those in the barren grounds are the smaller, and the smallest of all the deer tribe—musk ox also on the barren grounds.

Moose and elk are the same, mostly in the Peace River country; formerly found in the wooded country, from the Atlantic to the Rocky Mountains, and in the mountains. The names of the other animals given in my written communication.

54th Question:—A. These are all found in the barren grounds. I need not refer to other localities, as those better qualified than I am have named them.

57th Question:—A. The chief fish are the whitefish, salmon trout, grey trout, sturgeon pike (the jack fish) perch, eels.

58th Question:—A. Captain Healy, of the cruiser "Corwin" (steamer) went in 1885, through the Behring Straits to the Arctic. He names a whaling fleet of 42 vessels. 33 went into the Arctic, 18 of these vessels were from New Bedford; they caught 122 bowhead and 23 right whales. San Francisco fleet caught 100 bowhead and 12 right whales—257 in all, and one vessel not included.

Of whales in the Arctic off the coast from Behring Straits to Coppermine River (longitude 115° W). There are named by Arctic explorers white and black whales, norwhal, greenland, bowhead (four kinds); seals, salmon in the Coppermine and Back or Great Fish River; salmon also in great numbers on the west coast of Hudson Bay.

59th Question:—A. Fort Simpson (latitude 60°) would seem the best starting point, and a railway to that would give easy access to all the Mackenzie valley, and to the Arctic fisheries.

60th Question:—A. Yes.

62nd Question:—A. The northern limit of forests in North America is near the isothermal of 63 for July, which would go nearly to the Arctic Sea north-west of Hudson Bay. East of the mountains on the watershed are spruce; poplars (*populus tremuloides*) on the dry ground; balsam poplar on damp lands, of great size on Peace, Athabasca and Mackenzie Rivers; Banksian pine, two feet in diameter, on south shores of Hudson Bay; *pinus contorta* from the head of the Athabasca through the mountains.

66th Question:—A. Having tasted the tea made from it, think it would never be used.

67th Question:—A. The localities of these minerals are marked in my geological map in the Physical Atlas.

70th Question:—Have given full answer to this question in my written communication.

71st Question:—A. Geese.

72nd Question:—A. Yes; both going north and returning. Have given particulars in my written communication.

73rd Question:—A. Berries, grass, small fish, mollusks.

74th Question:—A. Have answered under 70.

76th Question:—A. Have answered this in my communication.

79th Question:—A. Impossible to get it to market until a railway is built.

82nd Question:—A. The Eskimo are all along the Arctic coast from Behring Straits, long. 17°, to Fish River, lat. 67° long. 94°; over 76 degrees of longitude to the coast of Labrador, long. 37°, making their range in North America 133° of longitude, over more degrees of long. than any other race.

83rd Question:—A. Reindeer, musk ox, walrus, seals, fish, wild fowl, and all land animals of the region in which they are.

86th Question:—A. Hearne names rabbits and hares, the latter numerous to lat. 78 degrees.

88th Question:—A. Buffalo (wood), cariboo (two kinds), wapiti (Canadian stag), moose, antelope. It would be desirable and important to protect all these.

89th Question:—A. The same probably as in every part of North America during 260 years.

90th Question:—Their labor has never been of much value in civilized states.

J. B. HURLBERT, called and examined.

By the Chairman :

Q. How do you account for the mild climate of the Mackenzie River country ?

A. As the sun passes over the equatorial regions every day it warms the water of the ocean. Warm water expands, so to speak, being lighter than cold water; rises to the surface, and necessarily flows north and south.

By Honorable Mr. Macdonald :

Q. Is it the cold water flowing towards the equator that drives the warm water out ? A. Yes; being heavier it passes under the warm current. The water flows in a northerly direction, and by the motion of the earth is carried in a north-easterly direction. The cold currents as they work south come in contact with portions of the waters that are moving eastward more rapidly, and therefore they are pressed westward. Now the winds from the same cause blow from the south-west towards the north-east. The sun passing over the equatorial regions heats the air, and, in moving north, it necessarily goes from south-west to north east. Hence the winds of the temperate zone necessarily blow from the south-west towards the north-east, and the winds which we have coming from other directions are only undercurrents. The warm waters of the Pacific fall upon the western coast of America, and the winds moving in the same direction pass over the land heavily charged with vapor. As they come in contact with the mountains a good deal of that water is discharged, as on the western coast of Norway or on the gaunts in India, and there is a great fall of rain, and necessarily less immediately east of them. Of course the openings in the mountains would aid, but if there were no passes the wind must necessarily go over the mountains; and hence, the winds from the Pacific warm the western coasts, while eastern coasts are chilled by cold currents and the cold winds of the east. In reference to the Chinook winds coming from Montana and the region south of that they would come in the winter from a very cold region. The whole of that part of the continent is very high in altitude, much of it high enough to make 15 to 20 degrees difference in temperature, a lower temperature than at the level of the ocean. The continent in Mexico is two miles high, and falls as it goes north spreading out like a fan. Through the central regions the country is so high that the railway to San Francisco for 1,300 miles is higher than the highest point of the surveyed route through the Peace River country from the Atlantic to the Pacific. The part of the continent in Wyoming territory and south of that being very high and the region of blizzards, it would be utterly impossible for warm winds to come from

there Besides the winds do not pass from south-east to north-west, but from south-west to north-east.

By the Chairman :

Q. You have asserted that the winds do not blow from south-east to north-west, it is not our experience in Manitoba? A. The currents of the ocean pass from south-west to north-east, and the winds are subject to the same laws as the waters of the ocean, but of course in the configuration of the continent the mountains or other causes may give rise to surface winds from different points of the compass. I could explain that very easily by reference to the most noted storms we have here—that is storms with winds from the north-east or east. You may notice that after such storms the winds come from south-west and are warmer. You will notice that the clouds coming from the south the farmers call a snow bank, because they come up like a curtain. This wind which comes from the tropics comes heavily charged with vapor, and in this latitude is blowing from the south-west, following the warm current of the ocean. As it comes up towards the north-east it meets with air that is colder than itself, and the air from the colder points will necessarily fall below. Water when it is converted into vapor, will occupy nearly two thousand times the space it will fill as water. Then when it is condensed from this vapor to water it necessarily leaves a vacuum. That vacuum is filled with the cold air coming in and that is what causes the eastern or north-east winds in such storms. Those winds causing the storm are followed by south-west winds the next day, so that these currents which flow in other directions are local currents like the eddies in a river.

Q. In apparent contradiction to your theory the testimony of most of the witnesses who have lived in Winnipeg Basin describe the prevailing summer winds as south-west; now if it is constantly blowing from the south-west how does the air that is displaced in that way get back to where it came from? A. I have illustrated that by the ocean currents, the colder water and colder air fall below the warmer. The cold water from the higher latitudes flow south-west, but are checked by the continents and hence form currents down the eastern coasts of Labrador and Russia; but the currents of air spread over the oceans and continents. The trade winds illustrate this: they blow from about 30° north latitude, from north-east to south-west, towards the equator; but the land being highly heated during the summer months, warms the air blowing over it from the north-east, and this warmer air rising, its place is taken by a constant supply of cold air. In the air, as in the ocean, there must, of course, be return currents.

Q. Your theory is that the upper current is from the south-west? A. Yes.

Q. The under current would be directly opposite? A. I do not say that the under current is constant, it varies. You can prove that for yourself by looking at the upper clouds in almost every day of the year, you will find the clouds going from south-west towards north-east. Blodget says that for 364 days in the year he never saw them moving in any other direction, and he had watched them a good deal of his life. Sir John Richardson passed down the Mackenzie with Kendall and along the Arctic coast to the mouth of the Coppermine River and ascended that river to Great Bear Lake.

By Honorable Mr. Macdonald :

Q. Where did he start from? A. From Great Slave Lake and descended the Mackenzie to its mouth. Then he proceeded along the Arctic coast eastward to the mouth of the Coppermine River. Franklin went down with him to the mouth of the river, and went west. Richardson went to the mouth of the Coppermine River and ascended the river taking a canvas boat with him, but he left it. He says it was impossible to use any boat unless with long portages. When he got up to where the stream comes in a little from the south, he left it and went to Great Bear Lake to his winter quarters. He reports fully upon the whole coast and upon Great Bear Lake. He gives a list of 170 flowering plants and he gives the grasses of that region. He found large valleys, filled with forests, but it was late in the season and he could not stay to examine them, but he saw them from the high lands. He says that these large valleys were well wooded. That would be considerably east of Great Bear

Lake, a region that is considered one of the worst parts of the barren grounds. He found the remains of large trees, and every day he camped in some grove, pine or spruce or birch—these were the chief trees. In passing along the Arctic coast wherever there were rivers he found timber about the mouth of them in such quantities, that, he says, if a steamer should go into the Arctic Ocean it would find wood enough to supply its daily fuel, and asphaltum or something of the kind, which is found west of the Mackenzie river—that it would find enough there to supply the daily wants of the steamer—that is between Mackenzie River and Port Barrow. He found June grass or Kentucky blue grass over a great part of the region. He does not name any part of the country between the Coppermine and the head of Great Bear Lake that was barren. Nor does he speak of any place along the coast as being barren.

Q. This map was colored by you, I believe? A. Yes.

Q. I notice that you have colored green the whole of the Mackenzie valley proper. Are you prepared to say that there are no barren grounds in the Mackenzie Basin proper? A. I can only refer to the testimony of others. I have never been in that part of the country, but I have never found a reference to any part where it was barren. Hearn started from Fort Churchill to go to Coppermine River. He made three journeys, not all the way to the river, but into the country. I have given in this report the animals and vegetables that he found. He did not succeed on his first journey and had to go back. He does not refer to any part of that country as barren. I have given the vegetables, trees, land animals and birds named by him.

Q. Did he give any sea animals? A. I have not given any here, but I have given all the sea animals of the Arctic coast that I could find named.

Q. How far from the coast, within the scope of this inquiry, have sealing vessels gone? A. I think they have gone through the whole of the Arctic Seas to some hundreds of miles from the coast. I find mention of them from the east to a point where vessels from the west have reached, but these north-eastern passages are very uncertain, and sometimes vessels have been detained there by ice for two or three winters. Captain Back came up to Athabasca Lake and passed through Great Slave Lake, and from Great Slave Lake proceeded to Back's or Great Fish River, and he gives an account similar to the reports of Richardson and Hearne about the flora and fauna of that country.

Q. Why did he call it the Great Fish River? A. I do not know that he did. The only name I find for it in his work is the Thlew-ee-choh. It is called now the Great Fish River. I was asked to draw a line to mark out the barren grounds west of Hudson Bay. I could not do so, because I found no evidence of barren grounds in the accounts of the explorers. They had found grasses, shrubs, flowering plants everywhere down to the Arctic coast, and trees and well wooded valleys, reindeer, bears and musk ox on what is called barren grounds east of Great Bear Lake. The musk ox has been found in latitude 81, about longitude 90, showing the warm current has some effect even there. Latitude 81° is 900 miles north of the north boundary of the barren grounds.

Q. Do you know of any better use that Canada could make of this Arctic archipelago than to stock the islands with the musk ox and protect them there? A. I do not know to what extent they might find food there. But it shows that there are pastures up as far as latitude 81, or these animals would not be found there. The snow goose was found on the 15th April, in latitude 54; on 25th April, in latitude 57, and on the 1st of May at latitude 64; it went to its breeding grounds, latitude 70, by the 1st of June, and it must remain there for five months, for it would take that time to pair, lay their eggs, hatch their young and give them time to feather sufficiently to fly away.

Q. Then you infer that there is open water at the mouth of the Mackenzie for five months of the year? A. Yes. The Arctic explorers found fowl so plentiful there that they say you could not throw a stone without hitting a goose or a duck, and they must remain there five months.

By Honorable Mr. Kaulbach :

Q. From your reading do you say it is a misnomer to call the country west of the Churchill and towards the Great Slave Lake and the Great Fish River the "barren grounds?" A. I do. I trust, of course, to the evidence of Arctic explorers.

Q. Do you think it is covered with fir and spruce? A. It is covered with birch, spruce, fir and Willow, and everywhere in groves and forests and with grasses and flowering plants of various kinds; and salmon are found in immense quantities in the Hudson Bay and as far north-west as the Coppermine River.

By the Chairman :

Q. Have you any information as to the salmon in the Mackenzie? A. I did not find any account of any, but I infer from the description of the *inconnu* that it is a salmon. It goes to the ocean and up again as the Atlantic salmon go to the head of Lake Ontario. Salmon, too, are found in many rivers which empty into the Arctic Sea. As the habits of the *inconnu* are so like the habits of our salmon, they are probably a true salmon. These early explorers do not seem to have been well acquainted with the various species.

VICTORIA, B. C., 20th April, 1888.

Honorable Senator SCHULTZ,
Senate Chamber, Ottawa.

SIR,—I am in receipt of your letter of the 5th instant, with its enclosure, asking me to answer various enquiries respecting the resources of the Mackenzie River Basin.

Having never been in that section of the country, I am unable, from personal observation, to give the information required.

I have the honor to be, sir,

Your obedient servant,

R. FINLAYSON,

Late of the H. B. Co.

Extract from letter of Lieut.-Governor Nelson.

GOVERNMENT HOUSE, VICTORIA, B. C., 23rd April, 1888.

MY DEAR SENATOR,—I received yours of the 11th instant on Saturday last with the queries in regard to the Liard and Peace Rivers, and this morning placed them in the hands of an old friend of mine who knows nearly all the mining men who have visited the section of the country you are enquiring about. I know that a few of our mining men have gone through on the Peace and the Liard to Slave and Mackenzie Rivers, and down the latter for some distance, but whether any of these are to be found in Victoria at present or not, I cannot say. I am on the way, however, to find out. I am taking the greatest interest in your Committee, indeed the exploration of that part of the country has been to me a subject of thought for some time, and it was with the greatest pleasure I saw a move made in the matter.

OTTAWA, TUESDAY, 1st May, 1888.

DR. BELL reappeared and was examined.

By the Chairman :

Q. What is the condition of the whaling and sealing of Canada in the Gulf of Boothia, west side of the Melville Peninsula, Fox Channel and Hudson Strait, and

in Cumberland Sound and Chesterfield Inlet? A. In order to make an intelligent answer to that question, perhaps I had better state a few facts with reference to the whale fisheries in the eastern part of the continent generally. About thirty years ago, the larger whales were quite common in the Gulf of St. Lawrence, and a large whale fishery business was done from Gaspé Bay. Forty years ago it was a considerable industry, and even thirty years ago no fewer than 7 or 8 vessels were employed in Gaspé Bay. In these days you could see the whales off the Gaspé coast; but the Americans soon after appeared on the scene and drove the whales further north. A few years later they were still found in the waters around Newfoundland and along the coast of Labrador, and in Hudson Bay, where they went in considerable numbers, and many large whales have been killed in Hudson Straits and Bay. Now you see no whales in Hudson Straits. They may pass out and in but they do not stay there. They have gone in to the north-west part of Hudson Bay, where a few large whales are still to be found. But the American whalers have driven them from the shores of Baffin Land to the Gulf of Boothia or Boothia Bay, as the Americans call it; and it appears as if a few of the larger species of whales are now on the verge of extinction—that there are barely enough left to propagate their species. The larger species live to a great age and breed slowly.

Q. What is the name of that species? A. The right whale is the favorite with the Americans. The sulphur bottom, the black whale and the right whale are the three large whales that the Americans pursue mostly; but the number is probably eight or ten of the large species of whales, known by different names. In addition to the three I have mentioned, the whalers kill what they call the finner, the bottle-nose, puffing pig, and the small, white whale or so-called "white porpoise." It is the most numerous of the whale species, and a very valuable animal. The means that the Americans employ frighten the whales, and are much more destructive than the old-fashioned methods of the Scotch whalers.

By Honorable Mr. Sutherland:

Q. Can you describe the methods adopted by the Americans to take whales? A. Yes; they use a swivel gun and throw bombs into the whale, and they also fire lances and harpoons into them by means of gunpowder, instead of throwing them by hand, and the whale has no chance against such appliances. You see he is taken at long range. After a hundred years or so of experience the whale has learned about how far a man can throw a lance, just as the ducks have learned the range of a shot gun; and they keep away a hundred or eighty yards from the hunter's range. So with the whales; they keep out of range of the old fashioned lance and harpoon; but when you attack them with well directed cannons they have no chance. It makes the capture of the whale much more certain after he is harpooned so that he can be held on to, as they can destroy life at once with a bomb and can secure the animal. The old fashioned whale was slow and dangerous. After a whale was harpooned he would haul the boats around perhaps for hours, and it was only by degrees the whalers could get at him to put the lances into him.

By the Chairman:

Q. What is the lifetime of a whale? A. It is unknown, but probably several hundred years. It is the most long-lived of all animals.

Q. How often do they breed? A. No oftener than once a year, and some species only once in several years.

Q. Are there ever more than one at a birth? A. I think that most kinds have only one young one at a birth.

Q. We are to understand then that the same causes, the use of firearms, &c., which led to the complete extirpation of the buffalo are now at work with these sea animals. Improved methods of destruction and lessening numbers narrows down the probability of any of them escaping? A. Yes; quite so. I fancy it is only a question of time when some of the species will become totally extinct. An animal which lives several hundred years and is only reproduced every few years will rapidly decrease in numbers when they are hunted and killed without discrimination.

Q. From your knowledge of the whale fisheries and the habits of whales, can you suggest any means that could be adopted to preserve those animals? A. I think that by charging a high license to permit whaling—either charge it on the number of whales killed, the quantity of oil obtained, or so much a vessel—would decrease it. The Russian Government, I understand, claim jurisdiction over the whale fisheries of the White Sea, which is quite open as compared to Hudson Bay, Boothia Bay and many of our larger bays. They charge something like £300 a season for a permit for a vessel to kill whales; and if the whalers do not pay it they are driven out of those waters. Now, if the Russian Government can claim control over the whale fisheries of the White Sea, surely we can control Hudson Bay and Boothia Bay, and if the Americans can capture our sealers in Behring Sea, surely we can capture American whalers found in Hudson Bay and Boothia Bay.

By Honorable Mr. Reesor :

Q. Would whaling and sealing be as valuable in Hudson Bay as in Behring Sea? A. No, I think not.

By Honorable Mr. Turner :

Q. The whale fisheries would be of considerable value? A. They would be of considerable value if we protected all our inland salt waters, the great channels and bays, and comparatively closed seas that we have in the north.

By the Chairman :

Q. I understood you to say that the seal fisheries of the Hudson Bay would not be as valuable as the seal fisheries of Behring Sea because it is the fur seal that is caught in the Behring Sea, while in our waters it is only the hair seal? A. Yes: but we have such a vast number of walruses and small whales, that in the future those fisheries may become as valuable as the seal fisheries of Behring Sea. If their oil should become more valuable than it is at present there would be enough in those fisheries to supply the world. The smaller the whales the more rapidly they breed, but the right whale has only young ones about once in three years and only one at a time.

By Honorable Mr. Power :

Q. About how wide is the entrance to Chesterfield Islet? A. It is quite narrow probably 10 to 15 miles.

Q. Do whales go in there? A. No; whales will not go into narrow channels; they are afraid of getting into a *cul de sac*.

Q. Do seals go in there? A. Yes; they go into those channels and up the rivers. I have seen small white whales in narrow channels, and when a boat approaches the entrance, they seem to telegraph it from one to the other for miles, and then make a straight line for the outlet at once. They seem to have a great fear of being caught in a *cul de sac*, and make out to sea at once.

By the Chairman :

Q. In the very valuable map that you have furnished the Committee, showing the geographical distribution of some of the principal mammals of America, you have indicated the line of sea animals of the mouth of the Mackenzie to extend from the coast of Alaska as far east as Wollaston Land, and then northward along that land. This would seem to be a distance upon the map, giving a western sea coast range to those animals of 22 degrees of longitude. Have you any reason to believe that those sea animals are as numerous there as they are on the east coast? A. I know nothing of that region except from reading, and I should judge from the remarks of old travellers as well as of those who have been more recently there, that whales are not uncommon in that sea. The Eskimos use the bones of the whales to some extent in building their huts; and they are mentioned by travellers as lying about on the beach in many places, indicating that they must have been numerous there at one time.

By Honorable Mr. Almon :

Q. How far south has the walrus been found? A. It has been found occasionally as far south as Newfoundland. The sealers in the month of March, kill one now and then on the ice. They become tolerably numerous when you get half way

up the coast of Labrador, and are abundant in Hudson Straits and on the islands on both sides of Hudson Bay.

Q. What is the value of a large sized walrus? A. They are not very valuable. They are large animals, as heavy as an elephant, but the blubber is inferior as compared with the blubber of the whale and the seal; and the skin, unless some new use is found for it, is of very little value. It is immensely thick.

Q. How about the tusks? A. The tusks are of some value for ivory. The largest tusks weight about six pounds a pair. I have specimens of two larger, but six pounds would be a large sized pair of tusks.

By Honorable Mr. Turner :

Q. Has the skin of the walrus any merchantable value? A. It is said that new uses are being found for it, as for example, in the making of emery wheels. It is a coarse leather, and when it is dressed it is as thick as your hand; in a green state it is an inch thick. It seems incredible, but it is nevertheless a fact: the skin when stripped of its blubber is too bulky to go into a large cask. We tried to salt one in the largest cask we had on board our ship on one occasion when I was out there, but it was not large enough to put it into. We had to make a tank of planks in order to salt it; and it was so heavy that the whole boat's crew could not lift it and we had to tow it alongside of the vessel and hoist it on board with tackle.

By Honorable Mr. Almon :

Q. About what would it cost to make an exploration of the Mackenzie River from its mouth to its source, and take soundings of the stream and acquire an accurate general knowledge of the country? A. The construction of the Pacific Railway enables us to get to the centre of the North-West Territories and roads have been made connecting with the waters of the Mackenzie River, where steamers are now running, so that it is now possible to do as much in one year as it was to have done in three years before the construction of the railway and steamers. The field-work might be accomplished by staying two years, for \$5,000, by an officer paid by the Government.

Q. The exploration of the whole river from its mouth to its source? A. Yes; by experience and economy, we can get along on two thousand or three thousand dollars a year with a good sized party, and by wintering there one might get two summers' work by staying out one winter.

By the Chairman :

Q. I find that from one of the eastern bays of Great Bear Lake to the nearest point on the Coppermine River, the distance is 40 miles; from Chesterfield Inlet to the head of the Great Slave Lake is 320 miles; from the harbor at Churchill to the head of the Athabasca Lake is 440 miles; from Prince Albert on the Saskatchewan to Fort McMurray, the junction of Clearwater and Athabasca, that point being chosen because there is then between that and the sea only one break, is 300 miles. From Fort Pitt to Fort McMurray the distance is 220 miles. From Edmonton to Fort McMurray, 225 miles; from Banff to Peace River Landing, 250 miles; from the head of Little Slave Lake to Peace River Landing is 63 miles. We measured that, because it was the route suggested by Bishop Clut. From the head of navigation on the Stikkeen River to Fort Liard, the head of navigation on the Liard River, is 370 miles. From Hazelton, presumably the head of navigation on the Skeena River, to the big bend of the Peace River in the Rocky Mountains, is 150 miles. These are all possible avenues of communication, and may be interesting to put it on record. Is that correct, Dr. Bell? A. Yes, I think that is quite correct. The new Government map by Captain Deville is based on a projection which is designed to show the distances with approximate accuracy.

Q. I would like to ask you whether you are satisfied that these maps that you have given us are substantially correct—that they are approximately as nearly correct as they can be given? A. Yes; they are estimates taken from maps of the largest scale available and plotted on the most accurate projections. It is very difficult to represent a large surface of the earth on any map so as to make accurate measurements. You can represent a small piece, like a township, with almost

perfect accuracy; but when it comes to a district of a thousand miles or more, in diameter, it becomes difficult to say what the exact area may be. Captain Deville has projected this map so as to show with approximate accuracy the distances.

Q. You have heard us read from the draft report the areas given of the Mackenzie Basin; are they correct as you intended them to be? A. Yes, as nearly correct as the information available at the time allowed. They might be revised, but I think with the data available, they could hardly be made more correct.

The Committee adjourned until to-morrow at 10 a.m.

LIST OF MAMMALS found in the regions between Hudson Bay and the western rim of the great Athabasca-Mackenzie Basin, compiled by R. Bell, B.A.Sc., M.D., LL.D., Assistant Director Geological Survey of Canada:—

Moose.	Ringed seal.
Reindeer or barren ground cariboo.	Bearded or square flipper seal.
Woodland cariboo.	Right whale.
American elk or biche.	Sulphur whale.
Virginia deer (in extreme south).	Black whale.
Prong-horned antelope or cabree.	Fin-backed whale.
Rocky Mountain goat.	Little white whale.
Rocky Mountain sheep.	Bushy tailed wood rat.
Musk ox.	White footed mouse.
Bison or "buffalo."	Long eared mouse.
Wild cat.	Little northern meadow mouse.
Lynx.	Chestnut-cheeked meadow mouse.
Wolf.	Large and northern meadow mouse.
Coyote.	Sharp-nosed meadow mouse.
Fox (red, silver and cross varieties.)	Tawny limming.
Kit fox.	Jumping mouse.
Blue fox.	Muskrat.
Arctic or white fox.	Arctic or Polar hare.
Wolverine, carcajou or devil.	Common American or varying hare (rabbit).
Fisher.	Canada porcupine.
Pine marten.	Little chief hare, or North American pika.
Weasel.	Beaver.
Ermine.	Northern pocket gopher.
Mink.	Northern flying squirrel.
Skunk.	Chicaree or red squirrel.
Badger.	Northern or town-striped chipmunk.
Otter.	Perry's spermophile.
Grizzly bear.	Woodchuck or ground hog.
Barren ground bear.	Hoary marmot.
Black and brown bear.	Star-nosed mole.
Polar, white or sea bear.	Forster's shrew.
Norwhal.	Bell's shrew (<i>Sorex Belli</i> , Dobson).
Atlantic walrus.	Silvery-haired rat.
Harbor seal.	

Professor Bell having written to the Reverend Father Petitot regarding the geology of the Mackenzie River district, received the following valuable report upon the subject:

(Translation.)

ISLE À LA CROISSE, 16th August, 1873.

MY DEAR SIR,—I received on the 30th May of the present year your highly esteemed letter of the 30th December, 1872, in which you deign to ask of me some information upon the geological constitution of the great Athabasca-Mackenzie Basin. I might limit myself to answering solely the two questions which you put in your letter, to wit, *first*, as to the rocks of the Rocky Mountains between Fort Simpson and the Arctic Ocean, whether they have a crystalline character, and are identical with those which form the banks of Lake Athabasca? *Secondly*, whether coal bearing deposits have been formed between the ranges of the mountains which border the Mackenzie and the ranges farther west, in the valley of Rat River for instance. By keeping to these two questions I would satisfy your requirements, but, having in fact traversed these vast districts, throughout, I shall allow myself some latitude on this interesting question, and shall send you, sir, this somewhat detailed report of my personal observations concerning the geology of the Athabasca-Mackenzie Basin.

I do not pride myself on being a geologist, and I have not a very deep knowledge of this science, only such as my linguistic studies and the exigencies of my ministry permit. You will, therefore, be kind enough, sir, not to look for any pretension in these pages, and for no vain showing forth of science, but only for the observations of an amateur, and a sincere desire to be of service to you as well as to the work for the profit of the country which affords me a living, and of which I am the very obedient servant and the very sincere friend. I shall be glad if the few notes which my journals furnish me may be of use to you when I transmit them, which I now do, in all simplicity and confidence.

I had hoped, sir, to be able to give you this information with my own mouth, for having undertaken a voyage of a year's length to France, I had flattered myself that I should have the advantage of meeting you at Montreal, but exceptional circumstances having happened to prevent, or at all events to put off this voyage, I send you this report, congratulating myself at all events that the voyage which I have just made from Good Hope to Isle à la Croisse has placed me and you in a position to prove and to verify the justness of my first observations.

1. The traveller, however little of an observer he may be, who descends from Portage à la Loche to the icy Arctic Ocean by the grand route of the Athabasca-Mackenzie, will not be slow to perceive, during the course of this voyage of 1,900 miles, that the surface of the country undergoes undulations about parallel with the lines which serve to indicate the degrees of latitude on the map. These undulations are determined by transverse spurs of the Rocky Mountains, which, detaching themselves from the primæval trunk at angles more or less direct, lose themselves towards the east or north-east, or rather enclose between them two ranges of longitudinal mountains. The first of these long ramifications fixes Portage à la Loche (Methy Portage) the culminating point of the lands situated between the basin of Lake Winnipeg and the Arctic Ocean: height 600 feet above the River d' Eau Claire.

2. The second ramification is sometimes called Montagne de l'Écorce de Bouleau (Bark Mountain), sometimes Caribou Mountain. It detaches itself obliquely from the Rocky Mountains, towards the 56th parallel, and runs from south-west to north-east, crossing obliquely also the River la Paix (in which it determines the Grand Rapid, 59°), pursues its route beyond the Slave River, in which it forms a barrier of falls and rapids well known to the voyageur (60°), and goes on to border the south-east part of the shores of Great Slave Lake.

3. The third ramification bears the name of Montagne la Corne (Horn Mountain). It traverses the Mackenzie at 62° 45' north latitude, flows to the south-west, describing a great arc of a circle, which forces the Mackenzie to follow the same curve and expires at the western extremity of Great Slave Lake. Its greatest elevation is about 800 feet above the Mackenzie. It measures about eighteen miles in width, and is composed of a succession of retreating terraces.

4. The fourth ramification is in the neighborhood of the preceding one. In *Platcôté de Chien* it is called *Chiw Kolla* (mountains ranged in line). The precipice which it forms on the bank of the Mackenzie is well known under the name of *Rocher qui trempe à l'Eau*. It detaches itself from the Rocky Mountains in the form of rounded hills reaching to about 1,000 feet in height; crosses the Mackenzie, latitude $63^{\circ} 29'$ north, leaving there an island of gneiss, reappears on the right bank under the name of *Rocher qui trempe à l'Eau*, and pursues its course eastward up to the 114th parallel. I have crossed it at the 118th parallel after having reached it at the 122nd. I give this chain the name of *Mount Vandenberghe*. Towards the east it does not exceed 600 feet elevation, and on the Mackenzie its largest diameter is about 24 miles.

5. Transverse branch: *Kodlen-Chiw*, or *Montagne Brulée*. It is only separated from the preceding one by about sixty miles. This eminence detaches itself from the western chain of the Rocky Mountains in the 64th parallel of north latitude, opposite the second elbow of the Mackenzie. Its course then is towards the east. It forms the valley of the River Blackwater, and continues its course into the interior to the edge of a chain of lakes which are tributaries of *McVicar Bay*. There it bifurcates; one of its branches forms the backbone of the peninsula which separates this bay from the body of Great Bear Lake, under the name of *Montagne du Grand Ours*. The other borders the south shores of *McVicar Bay*, and bears the name of *Ewi*. Height 800 feet above the Mackenzie, from 600 to 690 above Great Bear Lake; diameter from nine to twenty miles. It is to be remarked that all these high lands do not exceed a mean height of from 600 to 800 feet above the Mackenzie.

6. The sixth transverse ramification of the Rocky Mountains is found at the 65th parallel of north latitude. It is called *Kfwê-t-e-inkê*, or "rock which falls to the water," is crossed by the Mackenzie, rises again on the left bank at the mouth of Bear Lake River, under the name of the "Second *Rocher qui trempe à l'eau*," borders for a distance of about a score of miles the course of this river and connects with the eastern chain of the Rocky Mountains. Height 600 feet.

7. The seventh transverse chain takes its rise at the rapid *Sans Sault* (lat. $65^{\circ} 50'$) which it forms; then pursues its course towards the north-east under different names, of which the principal are *Montagne des Carpes*, *Montagne des Outardes*, *Terres Allignées*, and *Montagne du Remer*. It crosses the *Peaux de Lièvre* River, forms the basin of several great lakes, amongst others of Lake Colville, and ends not far from the banks of the Lockhart River, the principal affluent of the Anderson River, at the 67th parallel of north latitude. Its ordinary height is 800 feet. Its highest point, *Mount Remer*, measures 1,200 feet above the Mackenzie, and 900 feet above Lake Colville, which lies at its base. This mountain is composed of several terraces like the preceding, the greatest diameter of which is nine miles.

8. The eighth ramification is formed at $66^{\circ} 16'$ north latitude. It forms the ramparts of the Mackenzie, then under the name of "*Plateau des Bœufs Musqués*," it runs towards the north, where it runs up the river *Peaux de Lièvre*; thence towards the south to form the basin of great Lake la Loche and joins the preceding one. The "*Plateau des Bœufs Musqués*" *Yékk'ay-dié-nené* is also formed of natural terraces one above the other, the total width of which is about eighteen miles. Height 400 feet above the Mackenzie.

9. The ninth ramification detaches itself from the western branch at the mouth of the River Huart ($66^{\circ} 25'$ north lat.) It is called in *Peaux de Lièvre* *Tûâ-kk'ay-néné*. It is 400 feet high, ten miles wide, and forms several large lakes.

10. A tenth ramification, parallel to the preceding and only separated by a few miles from it, bears the names of *Eta tchô-kwêré*, *Rakhuénéné* and *Bettzen*, *Natséna-lari*. It extends from the banks of the Mackenzie to the junction of the River Iroquois with Lockhart River. Same dimensions as the preceding chain.

11. The eleventh and last ramification of the Rocky Mountains takes its origin in the main range at $66^{\circ} 48'$ north latitude, and bears the name of *Kîô-Kagan*. It crosses in succession the Peel River, forming there the ramparts *Tchilt'et*, the Mackenzie, where it forms those of the Narrows, and then, under the name of *Kivatliki*, runs to

the north-east, forming the valley of the river *Tsénétitén*, and goes to join the mouths of the Anderson under different names, too barbarous to write here. Its greatest height is 850 feet; its least 150. Its greatest width from six to eight miles.

II.

This set forth, let us proceed with the geological examination of each of these natural zones formed by these transverse chains from Portage la Loche to the Arctic Sea. I proceed from south to north.

First zone: From Portage la Loche to the Rapids of the Slave River.

The high lands of Portage la Loche and of all the region in that neighborhood from Lac des Sables, that is to say, the great basin which contains Lakes Serpent, Primeau, Isle à la Crosse, Vert, Clair, Buffalo, la Loche, and some others, are entirely sandy, as well as the valley of the River d'Eau Claire. One may without mistake consider this vast country as the bed of a small interior sea, whose waters flow off little by little by the drain which has opened across the rocks under the name of English or Churchill River. The depressions have remained lakes, and these lakes all communicate with one another by narrow channels or river branches without much current. Their waters are brackish, and covered with a green scum of repulsive odor.

I may state here that since about twelve years ago, when I saw for the first time Lake Isle à la Crosse, its western bank has lost from twelve to fifteen yards of soil upon which the water has encroached. Lines are now set in the same place where the landing was then, and soon bark canoes will be able to move about in meadows transformed into marshes.

On the borders of Lac Vert, which are equally sandy, I have picked up siliceous and orthosilicate feldspar, very pure, and I have seen limestone and boulders of granite and coarse porphyry. The valley of this lake seems to have formerly been the bed of a grand river like the Mackenzie.

Portage la Loche is the limit of the cormorant.

The valley of the River Eau Claire is altogether composed of sand, but the waves have denuded and disintegrated the rocks at several points, where rapids are found. These rocks are porous limestone, fissured, pierced with caves, and like a vast ruin. At some miles below the last rapid a sulphur and salt spring is found, which flows from three openings at the foot of a hill.

River Athabasca:—Schistose precipices from two to three hundred feet high, resting sometimes on sandstone, sometimes on granulous limestone, soft and shell bearing. Over an area of at least 25 leagues these schistose hills exude asphalt from top to bottom. The rocks are all black with it, and the banks are formed by this bituminous mass, mixed with sand and hardened by time. This liquid mineral fills the higher marshes and would be a rich mine to work.

On the right bank, at three hours' distance from the Forks, traces are to be seen of a subterranean conflagration, analogous to those of Fort Norman on the banks of the Mackenzie, the ramparts of the Porcupine and the River aux Boucanes.

Lower down upon the same bank is found a salt lake, named La Saline.

On each side of the river is to be seen limestone rising from point to point in undulating beds, which sometimes rest upon pudding stone. At the site of the old Fort de la Rivière Rouge, this limestone is entirely formed of fossil shells, amongst which are *terebratulæ* in quantities.

Along the River Pierre au Calumet schist is to be found, as well as a bed of red pipestone with which the Montagnais make pipes.

When the high schistose or limestone precipices disappear, yellow sandstone reappears, as far as the mouth of the Athabasca, where the periodical assaults of the water have heaped up the mud.

Limit of the male fern (*Asplenium*), of the Canadian honey suckle (*Lonicera Can.*), of the Turk's cap, and of the wild pansy (*Viola tricolor*).

You know the nature of the rocks which form the basin of the Athabasca. They are crystalline. In the depressions of this rock are to be found sand, and a little vegetable earth. No calcareous rock.

I regret to have nothing to say regarding the banks of the Peace River. Having never visited it, all that I can say about it here is upon the testimony of others. It is said to be very rich in minerals.

From Lake Athabasca to the junction of the Peace River and the Slave River, which here takes the name of Rivière des Rochers, presents the same rocks as the lake from which it flows. From the junction to the first rapid formed by the chain of the Caribou Hills, granite is sometimes to be observed and sometimes calcareous rock disposed, as in the River Athabasca, in undulating beds, sometimes exposed and sometimes submerged. The soil is fit for culture wherever there are no rocks.

Limit of the heron and the bittern.

Second zone: From the chain of the Caribou Hills to Montagne la Corne.

The chain of the l'Ecorce (Bark Mountain) and of the Caribou Hills is only an immense sand bank resting upon a granitic base. It conceals, so say the Montagnais, much gemmeous salt. The same may be said of the valleys of the Rocky Mountains on both banks. From these heights the River au Sel flows, the salt springs of which furnish all the trading posts in the extreme North-West.

The greatest elevation of this system is 800 feet. Its width at Portage de la Montagne is a quarter of a mile.

The rapids formed by this mountain in the Slave River present crystalline rocks altogether, granite, syenite, diorite, chlorite, porphyry, &c., which the work of the waves has laid bare. However, calcareous rock is mixed with these rocks at the last rapid. The banks of the river at this place are purely arenaceous. The sand shows in considerable quantities all along the River au Sel to its estuaries; then comes muddy deposits over an immense extent; then finally the liquid mud at the mouth. It is evident that at an epoch far removed Slave Lake must have extended to a point in the neighborhood of the rapids.

Limit of the pelican, of the asphodel of the *ficaria aquatica*, of the *campanula rapunculus*, of the kakèche, gold-eye (*hyodon chrysopsis*).

Great Slave Lake:—To the north and east the banks of this immense basin are raised from 80 to 200 feet above its level and are composed of granitic rocks. Simpson and Caribou Islands are blocks of orthose feldspar without any mixture. On the long and narrow peninsula which separates the two bays, Christie and McTavish, the Montagnais find serpentine, out of which they make their pipes. Gross Cap and all the eastern shores are also of crystalline rock, as well as the islands in Fort Ray Bay, but the west shore of the same bay is formed of calcareous rock stained red by the presence of oxide of iron. On the south shore of the lake mines of asphalt are found.

To the south and to the east the banks of the great lake are flat, composed of alluvium and gravel, the limestone of which is shell-bearing at Point Brulée. It contains madreporas or corals, belemnites and bivalve shells stuck together, and is altogether similar to the deposits of the same nature which the banks of the Mackenzie afford in the neighborhood of Good Hope and along the Peaux de Lièvre River. There are no *Terebratulæ*. The Brulée Islands present parallel and alternating undulations of limestone and of sand, the strike of which is from north-east to south-west. On the islands off shore asphalt is found, the hardened débris of which is strewn on the beach.

At Pointe de Roche, alluvium, boulders, granitic and otherwise, syenite, gneiss, bitumen, sandstone and trap, water-worn. In this lake we commence to find the inconnu or Mackenzie salmon. The marshes on the west shore contain gypsaceous tufa held in solution in the water.

From Slave Lake to Petit Lac nothing is met with but alluvium, containing many water-worn flints.

Limit of the Platouche, of the grey heathcock, known as the prairie chicken, of the *ephemera*, of the bat, and of the *buprestes octopunctatus*.

Third Zone : From Montagne la Corne to Rocher qui Trempe à l'Eau.

The terminus of Montagne la Corne, as I have said, is found at Petit Lac, formed by the expansion of the Mackenzie at its exit from Great Slave Lake. It forms the valley of the river upon its right bank, while a calcareous hill known as Montagne du Lac la Truite flanks it on the left bank.

From Petit Lac to the River *Na-hawér*, an affluent of the Mackenzie, nothing is seen but alluvium, sediment, gravel and boulders, which are varied and numerous, heavy, and joined to rocks *in situ*.

I have not explored the banks of the Rivière des Montagnes.

At miles from Fort Simpson the Rocky Mountains appear in the form of a long wall, from 800 to 1,000 feet in height, which borders the river for several leagues. Seen from the Mackenzie, its structure seems schistose, but I am doubtful as to that. The section of these mountains is obliquely stratified by undulating beds, the inclination of which is from north-east to south-west. At the mouth of the River *Na-hawér*, where the mountains are evidently calcareous, a conical hill rises for some 800 feet in height, at the summit of which the Indians say there is a salt spring.

The right bank of the river is similarly bordered by a chain of calcareous mountains.

The commencement of Montagne la Corne forms in the river the small rapid called *Petite-Poissons* (*Tuáya-mi*). At this place the mountain, which borders the River aux Saules, is not more than 300 or 400 feet high. It is completely wooded.

Fourth Zone : From Rocher Qui Trempe à l'Eau to Montagne Brulée (Elbow of the River).

The Rocher qui Trempe à l'Eau, the terminus of the *Chiw Kolla* Mountain, is a mass of limestone disposed in gigantic slabs, which rises to 400 feet above the Mackenzie on the right bank, in a nearly vertical precipice. These strata, lifted up and turned over at the edge, are traversed by veins of quartz. It is probable that the structure of this mountain is the same in the interior, but as I have only crossed it in winter, I cannot say anything as to that. I will only state that at 118° of latitude it is granitic, as well as all the country situated on the same parallel, and also the regions in the neighborhood between the north of Slave Lake and this point. The vast deserts which stretch between this small interior sea to the south, Great Bear Lake to the north, the Coppermine to the east and Montagne la Corne to the west, are entirely composed of crystalline rocks, amongst which feldspar, which forms the planetary nucleus, abounds. What is not rock is marsh, sand or lakes.

Chiw Kolla, or rather Mount Vandenberghe, is the limit of the Weymouth pine and of the balsam poplar. At the foot of Rocher qui Trempe à l'Eau there is a little eminence ten or twelve feet high, whence flows a mineral spring containing alum, sulphate of iron and magnesia, which communicates a yellowish color to the rock. Similar exudations also show on the top of Rocher qui Trempe à l'Eau.

Along the course of the Mackenzie from this point to the second elbow of the river, which is formed by the *Kodlen-Chiw* Mountain, the beaches have a monotonous appearance and show only alluvium, containing much water-worn shingle or boulders. The double chain of mountains which borders the river is limestone.

Fifth Zone : From the Kodlen-Chiw Mountain to Great Bear Lake River.

Kodlen-Chiw or Montagne Brulée is of calcareous structure, as are also all the eminences which border the south and east banks of Great Bear Lake, as well as those which form the backbone of the great peninsula which separates Keith and Smith Bays. It is to be remarked that generally the crystalline rocks show in the north-east and the calcareous or schistose rocks in the north-west. At the end of Keith Bay (Great Bear Lake) the *Kivi-Tchi* Mountain terminates in a shallow cave pierced in the limestone rocks, the only cave which I have seen in these regions.

Lower down than the Elbow the Mackenzie is bordered on the right by the chain of the Clarke Rocks, the culminating point of which appears to be about 1,900.

feet high. It is of a saddleback shape, seen from in front, and like a melon cut open, seen from Fort Castor qui Déboule. Its structure is calcareous. It contains mines of gemmeous salt, and a salt river flows from its foot. This chain is prolonged very far to the north. It first crosses Great Bear Lake River (which I propose to call by the name of the illustrious Franklin) and there forms the Grand Rapid, fifteen miles long. Much coal-bearing sandstone is found along this rapid, and the mountain on its left bank is also composed of it, but that on the right bank is calcareous and remains calcareous all along to its junction with the *Kfivè-tchô-détellé* chain on the banks of the Peaux de Lievre River. This chain which is named at first *Tehané-tsu-chiw*, then *Ti-della*, presents this peculiarity, that it resembles a long file of volcanic cones, which must have risen at a far distant epoch, without, however, having had enough expansive force to constitute volcanoes. It is entirely denuded along its whole extent, and is composed of conical eminences disposed along a single line at almost regular intervals. This mountain is reached by a plateau which rises gradually from each side to its foot. There the country suddenly descends again and leads one towards the calcareous rock, the crests of which rise from 400 to 800 feet above the surrounding region. The limestone of which the entire system is composed is sometimes "milky," sometimes crystalline, and in many places dolomitic through the contact of sandstone or of some other underlying trachytic rock. Its general aspect has not a bad resemblance to a long chain of icicles erected along one of the large crevices which form on the surface of our great lakes.

Leaving the old fort named Castor qui déboule, the banks of the Mackenzie present a soil sometimes arenaceous, sometimes marly, varying from 100 to 200 feet in height, which is continually slipping down through the effect of rain and the melting of the snow. Six miles above Fort Norman, and for an extent of from 8 to 10 miles, the Mackenzie is bounded on its right bank by a precipice which reaches at first about 160 feet in height and gradually diminishes to a height of 30 feet. It is a vast tertiary deposit composed of alternate stratifications of friable schist, lignite, pipe clay and vegetable mould. These various beds are oblique, and undulate from south to north. They are, therefore, the effect of the waters of the Mackenzie at a distant era. The schists are in a state of combustion winter and summer, but the subterranean fire which shows itself on the surface through smoke holes, stinking of bitumen, is intermittent and breaks out sometimes at one point and sometimes at another. It is not always visible on the surface, but this summer it is very active. The soil is very hot, damp and movable in the neighborhood of these smoke holes. Walking is obstructed by heaps of volcanic earth and puzzolana.

The pipe clay has been roasted by the subterranean fire and transformed into brick. It contains, or rather it is nothing but an immense mass of leaves of trees, the *parenchyma* of which has been destroyed, but the fibres and all the lineaments of which appear upon the thin bed of clay which covers them in such a way as to resemble impressions. I have been able to distinguish perfectly leaves belonging to the genera, *acer viburnum*, *taxum* and *pinus*. It may also be said that impressions of *caryopses* of maples in thick tufts are found in this pipe clay.

The lignites are not fit for forging work. Sometimes even the trunks of the trees which form the beds of it have not been transformed into clay; however, all this débris has evidently undergone the action of fire. They contain numerous petrifications. Several pieces of smooth grain which I took at first for palms now seem to me to be maple. Many other pieces which I have found and handled are white spruce. For three years I was able to observe an enormous petrified spruce trunk which lay at the mouth of Great Bear Lake River. I was not able to find it again this summer; the ice must have carried it away or covered it up.

These petrifications present places converted into quartz, or rather encrusted with quartz, whilst others are encrusted with iron slime. Indeed certain parts are still intact and show the wood just as it was. This place is called *Les Boucanes*. The geologist cannot fail to find an interesting field there. Porcelain clay, red ochre, and asphalt hardened by the water, are also to be remarked there.

In the basin of Great Bear Lake this zone presents flat shores, sandy or marshy. To the south-west there are immense and excessively arid steppes. Great Bear Lake River, or Franklin River, presents alternations of granite, limestone, and coal-bearing sandstone. Its navigation is very dangerous and requires a native guide.

Fort Norman is the limit of the saskatoon, gooseberry, potato, and of the cereals; of the curlew, the golden plover; and of the *fringilla leucophris*.

Sixth Zone: From Franklin River Mountain to Rapid Sans Sault.

The mountain range, which is found at the mouth of the discharge of Great Bear Lake, is formed of coarse and granulous limestone, dolomitic at several points. Its color is yellowish. As to its form, it does not present any stratification, but is found piled up in amorphous masses, just as it has been remarked in the principal chain of the Rocky Mountains on each side of the Mackenzie from this point in the chain of the Clarke Rocks, and thence on. Traces of fire are visible there in large patches of poppy-red colored earth, which spot the flanks of the mountain at about 400 feet height. A little higher than this mountain are found the smoke holes of which I have just spoken; a little lower down, below the rock, the beaches of the river present unequivocal traces of other schistose smoke holes which have been extinct for a long time, but which I found in combustion in 1869. From the foot of the mountain to the extremity of the long point of land where these extinct smoke holes are found, I found amongst the alluvium of the river numerous boulders, petrified wood, belemnites and coprolites of *ichthyosauri*. At the foot of the mountain is also found a spring of sulphurous water.

The double chain of the Rocky Mountains, which encloses the Mackenzie from this point to the rapid Sans Sault, is calcareous. The last mountains on the right bank present stratifications in their precipices. They are inclined from north-west to south-east. In this district are found other sulphurous springs, as well as mines of asphalt in the marshes. All this is on the right bank, which seems the best portion. It is always on this side that traces of the volcanic element are to be observed, from the mouth of the River Eau Clair to the Arctic Ocean.

At the extremity of the expansion of the Mackenzie, which has received the name of Grande Vue, is found a transverse rock 300 feet high and several miles long, which causes the waters of the stream to deviate towards the north-west. This is Rocher Rouge, called also Rocher Carcajou. It presents a steep slope formed by sliding earth and by landslips, which were in a state of combustion in 1868. I saw with my own eyes the fire and the smoke, an evident proof that there are tertiary beds existing below similar to those of which we have spoken above, and which have been the cause of the landslips in question. Farther on, this range presents large vertical beds of stratified limestone similar to that of Rocher qui Trempe à l'eau. It is similarly veined with quartz, and it is said that there are also to be seen there coal-bearing sandstone, sulphurous springs, asphalt, and iron slime in the marshes.

The left bank, opposite Rocher Rouge, exudes feruginous water, which stains all the water borne shingle of the beach with oxide of iron.

The Rapid Sans Sault presents friable schists similar to those seen farther up and obliquely stratified. Their inclination is from north-west to south-east, that is to say, running inversely to the stratification presented by the mountain. At the foot of the rapid there is a sulphurous spring on the right bank, and calcareous rocks piled up on a base of pudding stone, as in the River Athabasca.

In the interior to the east of the Mackenzie, the country is mountainous and of calcareous formation.

7th Zone: From the Rapid Sans Sault to the Ramparts of the Mackenzie.

The Rapid Sans Sault is determined, as I have said, by a chain of mountains, which, detaching itself from the Rocky Mountains, runs towards the north-east and bears different names. Its structure is calcareous throughout its whole extent. Between the two Rapids Sans Sault and des Ramparts nothing is to be found along the Mackenzie except alluvium, sand, gravel, and shingle or boulders.

Richardson has given a good description of the first Ramparts of the Mackenzie, only in all the historical or dramatic episodes which he attaches to them the learned doctor commits a great geographical fault. He ought to have referred them to the Ramparts of the Narrow, situated a hundred leagues farther away.

The Ramparts are composed of marl, lias and limestone, alternated and superimposed in slightly oblique beds, the inclination of which is contrary to that of the water course, so that the same beds of rock, which at the commencement of the rapid are found 1 foot only above the water, are at the exit from the Ramparts from 100 to 150 feet above the level of the stream.

There are to be found in the Ramparts a soft shell-bearing stratum (*molasse*), fossils of medrepores, sea urchins or sea chestnuts, belemnites, terebratulæ and coprolites of *Ichtyosauri*. The water-worn shingles or pebbles stained by oxide of iron, which are to be remarked upon the beach at the head of the rapids, contain quartz in nodules. Schist of a dendritic appearance is also to be found there.

I have not been able to judge myself of the structure of the Rocky Mountains in the district comprised between Fort Norman and the Richardson chain, of which I will speak further on; but I learn from the *Eta-gstinné* Indians who frequent Fort Good Hope, that between the Sans Sault Rapid and Fort Good Hope, in the valleys of the Rocky Mountains, volcanic formations and tertiary deposits are met with, similar to those of Fort Norman and of the Porcupine River. These Indians have spoken to me of red and blue earths, of sulphur and of extinct smoke holes. They have given me unfossilized remains of bivalve shells, which I believe to belong to the genus *cyprina*, which have been found on the summit of the mountains whose elevation above the Arctic basin cannot be less than 1,500 or 2,000 feet.

In the east this zone only contains calcareous hills and alluvium.

8th and 9th Zones : *From the Ramparts of the Mackenzie to the Great Eta-tchô Kfwèrt ridge (Polar Circle).*

I include these two zones in one and the same paragraph, because the two chains of transverse hills which separate them are very near each other.

The banks of the Mackenzie below The Ramparts are formed of alluvium, containing a large quantity of sand and water-worn calcareous stone, coprolites in considerable number and belemnites.

The banks of the River Peaux de Lièvre are formed of alluvium, amongst which are found numerous calcareous fragments containing bivalve shells of the genus *Pecten*. To about two-thirds of the way from its mouth it is bordered with calcareous hills from 150 to 300 feet high, ranged in terraces and with horizontal beds. The source of this water-course is found in Lac du Vent, and not in Smith Bay of Great Bear Lake, as Richardson contends. I have ascended this river from its mouth to its source. It is only separated from Smith Bay by a height of land of a few hundred yards. The shore of Smith Bay, which I have traversed several times and for all purposes, is composed of horizontal calcareous beds half buried in a sandy soil. These shores are almost flat towards the west, and to the north only reach from 20 to 50 feet in elevation. The Indians call this shore *Kfwkkd-Kla*, that is to say, "Flat Rock Bay."

Need I affirm here, contrary to Richardson's assertion, that Great Bear Lake has only one outlet, which is the *Télini-dé*, or Franklin River? It is the same way with Lake Claire, Lake Wollaston, and the famous and problematical Lake Requin, and with all the basins to which two outlets are attributed. Those who speak of them have not seen them at all, and have badly understood the statements of the Indians, upon the faith of which they have spoken about them.

Smith Bay, as well as Dease Bay, are bordered on the north, at some little distance, by a chain of mountains, which I have crossed several times, and which is divided into three trunks, named *Nont'yen Kfwè* (Mountain of the Steppes), *Lét'allé* (The Separated Land), and *Ti-Dégallé* (The Land Hardened by the Frost). From this last trunk flow the two sources of the Anderson River, or *Sio-tchgo-ondjigee*, which is not called *Bégulle déssé*, a name which is purely Montagnais, and belongs to

a dialect which is only spoken 400 leagues farther south. This mountain is calcareous on the borders of Smith Bay, where it is not more than 400 feet high. I imagine that its structure is the same all over its extent, but I have not been able to judge of this, having crossed it when it was buried in snow and ice. In the extreme north-east it is entirely barren. In the west its summit is wooded with white spruce and larch.

The Anderson is very much confined. The high plateau in which this river has dug itself a bed rise from 200 to 400 feet above its waters, the volume of which is not very considerable. At its mouth it is divided into several channels separated by pretty high land. All vegetation disappears upon its banks above 68° of latitude. Beyond Fort Anderson its right bank is bordered by a chain of rocks entirely denuded, the structure of which I have not been able to judge of, having seen it in winter. According to the form of its peaks I think it is calcareous. It is about 800 or 1,000 feet high. This chain separates the Anderson from the McFarlane, another stream which is parallel to it, and which flows also from *Ti-dégale*.

All that I can say of the valley of the Anderson is that the high beaches which border it are sometimes calcareous and sometimes sandy. I have seen no granite there, but I repeat that having only travelled it in winter I have not been able to make many observations in this respect.

Three or four leagues below Fort Good Hope iron pyrites is found on the beach, which the Peaux de Lièvre used formerly to use to strike fire with. In several of the marshes in the neighborhood of Good Hope a white earth is found, a sort of gypsiferous tufa, as well as asphalt in great quantity.

Ramparts of sandstone are found five leagues below Good Hope on the left bank, and others, of limestone and of yellowish clay alternately, at the mouth of the River *Ti-dagori* on the right bank.

From the Ramparts to the great *Etacho Kfwé* ridge, and beyond, the Mackenzie is bordered on its right bank by a chain of sandy and wooded plateaux named the White Hills. Their greatest height is 400 feet and their greatest diameter a day's march.

10th Zone : From *Etacho-Kfwé* to The Ramparts of The Narrows.

The tenth ramification which extends from the Mackenzie to Lockhart River, where it unites in a sort of way with the *Ti-della* chain which comes from Clarke's Rocks, after having described a great circuit towards the east and north, forms a sort of natural barrier under the Polar Circle, which separates the lands situate below the circle from those which are beyond it.

In this zone, on the banks of the Mackenzie, the river is bordered on the right by the same chain of sandy hills, which after being called the "White Hills" are now named the "Causeway of the Giant Beaver." Its greatest height is from 500 to 600 feet. On the left bank is a ridge of the same appearance and of equal elevation, Trout Mountain. The beaches of the river are composed of banks of sand and of gravel. There is to be seen there a good deal of water-worn granitic and calcareous pebbles.

On the right bank, opposite the site of the old Fort Good Hope, there are again natural ramparts of limestone, or of schistose sandstone (I do not remember which) at the mouth of Thunder River. Traces of fire are very visible in these rocks, which are from 80 to 150 feet high. One finds there hæmatite, or oxide of iron; sulphate of iron, and sulphate of magnesia; alum, which exudes from the fissures in the stone; and red ochre. It was here that the Peaux de Lièvre discovered in ancient times the hæmatite, which on account of its color, resembling the dung of the black bear, they called *Sa-tsanné*, that is to say, bear's excrement. Lower down upon each bank of the river a long precipice is found, the sliding slope of which is cut at regular intervals by ravines which divide it into a long series of truncated cones. This is Franklin's "Cannon Shot Ridge."

In the eastern centre this zone contains a vast plateau of barren lands, which extend between the Anderson, the Mackenzie, Great Bear Lake and the sea. This

mountainous plateau contains numerous lakes, several of which present the peculiarity that they have no apparent outlet, but that they discharge one into the other by subterranean water-courses or channels. I have visited four of these great lakes which have no other outlet. The level of several of these basins is falling from year to year; some of them are completely dry, others present wide flat and arid shores, and sand or gravel banks entirely barren, which are so many proof of their partial drying up. A chain of these great lakes extends between Smith's Bay of Great Bear Lake and Lockhart River on one side, and Anderson River on the other. They must have formed in primitive times a notable portion of Great Bear Lake.

Nature of the soil, limestone in horizontal beds; sand, alluvium.

Eleventh Zone: From the Ramparts of the Narrows to the icy Arctic Ocean.

The second Ramparts of the Mackenzie, called the Detroit or Narrows, are composed of lias and limestone, which exude alum and saltpetre. Lower down are schistose sandstones, of which the Esquimaux make the heads of their arrows. Height from 60 to 150 feet, over an extent of 20 to 22 miles. Friable schists at their extremity on the right. Sand and mud in the vast expanse of water which opens at Point Separation.

The right bank of the Mackenzie continues to be bordered by the long sandy plateau which takes here the name of *Kuat-Idi*, to its junction with the chain of the Sandy Caribou or *Kroleystok* mountains. Height 600 feet.

At 60° 50' latitude the spruces disappear. One meets with here the *arctomys*, the eider duck, the barnacle goose and the blue fox.

On the sea coast and the right bank the Esquimaux have told me that there are caves containing fossilized bones of large antediluvian animals, particularly of the mastodon, of which they have shown me pieces of tusks of the finest ivory, which they call *killigvark*, and which they know how to distinguish perfectly from the ivory of the walrus, or *turark*.

They have also told me that there are upon the seashore to the eastward, tertiary deposits in combustion, similar to those at Fort Norman. They call them *ignéroît*. There are also others on the west side of Bathurst Cape, whose high plateaux were taken for a chain of mountains by Richardson, and wrongly called Melville Mountains. This plateau is raised about 500 feet above the Arctic Sea.

Frogs are found to the mouth of Peel River, and the *doré* or river perch in the Anderson River, notwithstanding Richardson's assertions to the contrary.

As the learned doctor has well remarked, the extremity of the Rocky Mountains which stretches towards the mouth of the Mackenzie is composed of spurs of mountains all stretching obliquely towards the north north-east. What several Arctic explorers have ignored, is that this chain does not border the Mackenzie, but is found nearly thirty miles to the west of it along the mouth of the Peel, several channels of which are tributaries of the Mackenzie, whilst others flow directly into the sea; so that this stream, the last affluent of the Mackenzie on its left bank, is at the same time a veritable river flowing into the ocean.

The Rocky Mountains, as one crosses them between Fort McPherson and La Pierre's house, are composed of five parallel ranges of mountains, of which the middle one is schistose, and higher than the two others which flank it on both sides and which are calcareous. I have not observed deposits of coal nor traces of fire in any of these ranges. They have nothing in common with the soils of Lake Athabasca. I have seen neither granite nor feldspar there. Several other ranges which are crossed by the Porcupine River, the north branch of the Yukon River, on the west side of the Rocky Mountains are similarly calcareous, and are not more than 400 or 1,000 feet in height; whilst the highest chain of the Richardson Mountains measures quite from 4,000 to 5,000 feet.

To the chain of the Castor Mountains (*Táha-tcha*) (which crosses Alaska territory obliquely from the Romanzoff chain at the north-east to Mount St. Elias at the south-west) the banks of the Porcupine show only alluvium, sand, banks of gravel pierced across by calcareous beds, but no granites. Sometimes a limestone is found

resting on sandstone and surmounted by a bed of clay or sand, as it is to be seen in the ramparts of the Mackenzie.

On nearing the *Tdha-tcha* chain the nature of the soil changes; precipices of yellow sand and vast plains of sand; then banks of ashes and puzzolana from 100 to 120 feet in height, which are continually slipping down; bare mountains, piled up one on the other, which stretch along the right bank in an oblique direction from north north-east to south south west, so as to bar the passage of the river. They are composed of mounds or cones with a large base, piled up and forming a long range of about 1,000 feet in height. A prodigious fissure, a sort of crevice, due to the action of fire, opens in the flank of the mountains. The Porcupine falls into it, and wears for itself a tortuous and difficult passage for a distance of about sixty miles, which is the diameter of the range. On coming out of this canon, whose truncated peaks rise from 300 to 400 feet above the water, the *Tdha-tcha* range occupies the left bank and pursues its course to the south-west. These gorges are what are called The Ramparts of the Porcupine River. The name of Rat River is altogether wrong, and is more particularly applied to the Bell River, which is a tributary of the Porcupine, and on the banks of which La Pierre's house is situated.

The Gorges or Ramparts of the Porcupine offer a vast and magnificent field to the geologist and mineralogist. The Neptunian and Plutonian elements have united there to form rocks and soils of an extremely varied nature, which make an interesting study. The traces of fire there are recent, and are analogous to the smoke holes of Fort Norman. Coal, anthracite, gneiss, red ochre, trap, porphyry, marble, feldspar pure and rose-veined, all the varieties of granite, gypsum, sulphur, talc, blue marl and a quantity of other mineral substances, show themselves in profusion in this canon, as well as mineral waters. Moreover the rocks, by their singular and capricious forms, as well as by their striking, and one might say improbable colors, present to the brush of the landscape artist scenery of a rare and striking character.

Unfortunately the course of this river is dangerous by reason of the rapidity of its waters, as well as of the many banks which intersect its course. Bark canoes cannot be procured there. The *Loucheux* or *Dindjé* of the river only travel with rafts.

III.

In closing this over-long report, in the course of which I believe I have replied to the two questions which you have done me the honor, sir, to put me, it remains for me to furnish you the information which you ask me for about the accomplishment of your journey.

You will find, sir, at Fort Chippewyan and at Fort Simpson, the boats, men and provisions necessary for the exploration which you propose to make, whether along the Peace River or on Great Bear Lake, along the Coppermine, the Mackenzie, or in the Rocky Mountains. The officers of the Hudson Bay Company always make it a pleasure to be of any assistance to travellers whoever they may be, and all the more when they carry a Government warrant, and when they are discharging the duty which has for its object the well-being of the country and the development of science. My friend, Mr. Hardisty, the chief of the Mackenzie district, has spoken to me in these terms, and has authorized me to reply to you to this effect, as far as respects his post, Fort Simpson.

The best way of making an expedition to Great Bear Lake would be to go there in summer and to wait at Fort Norman till the ice had left the lake, which does not take place before the middle of July. The navigation of Great Bear Lake River, which is open from the end of May to the end of June, is again obstructed by ice coming down from Great Bear Lake from the 1st to the 15th of July, but this varies.

From the middle of July to the end of September, the lake is open, although you may always be exposed to meeting ice out in the lake. Later than that it would be imprudent to navigate Great Bear Lake. But at the end of September it would be easy for you, sir, to re-descend Great Bear Lake River and to re-ascend the

Mackenzie to Athabasca, and even farther; or to go and winter either at Fort Good Hope or at Peel River Fort.

To ascend the Rocky Mountains in autumn, or at least to venture upon the Porcupine in a canoe or *bédare* would be imprudent, because of the nearness and severity of the winter. It would be better to wait until the month of June.

Before finishing, it remains for me to place myself entirely at your disposal, as a draughtsman, co-operator and interpreter in the Dere (?) and Tunok (?) languages. There will be no doubt of my superiors approving of my following you without any pecuniary compensation, in case you think fit for the success of your expedition to give me the honor of forming part of it.

Accept my feelings of the highest esteem, with which

I have the honor to be, my dear sir, very sincerely yours,

E. PETITOT, *Ptre.*

My address is: R. P. PETITOT, at Fort Good Hope, Mackenzie River District.

Mr. ROBERT BELL,

Geological Survey of Canada, Montreal.

WINNIPEG, MAN., 21st April, 1888.

Hon. Dr. SCHULTZ, Ottawa.

HONORABLE SIR:—I was just reading a list of parties you sent questions to concerning the northern country. I would like to add another name to it, if it is agreeable to you, that is, Donald McIvor, of Kildonan East. He was sixteen years in the Hudson Bay Company's service, and was four years inside of the Arctic circle; he sailed down the Mackenzie River to the Arctic Ocean, then up the Arctic River and crossed over to old Fort Good Hope. He has often told me he would rather live in the Peace River country than in Manitoba; he says it is a far finer country. He is a regular encyclopædia concerning that country, and could give you valuable information concerning food, minerals, agricultural resources, &c. Hoping this will meet with your approval, as everyone here is taking a deep interest in your committee,

I have the honor to be, sir, yours very truly,

D. A. ROSS.

Answers from DONALD McIVOR, farmer, Kildonan P. O., Manitoba:—

1st Question:—A. Any information which I can give is from actual residence in the Mackenzie River District of over six years, and will embrace nearly all the district watered by the Mackenzie, Athabasca and Great Slave Rivers.

2nd Question:—A. I consider the Mackenzie navigable right from the coast a distance of 1,000 miles; Great Slave some 300 miles further. The Athabasca is also navigable a great distance; are all of great depth; current swift; would at least be navigable by steamers of 500 tons.

4th Question:—A. Great Bear, Great Slave and Athabasca are the chief. Great Slave the largest, about 180 miles wide, great depth, numbers of good harbors. Bear and Athabasca also large and deep; excellent harbors also; any of them would be suitable for steamers such as run on our Canadian lakes.

5th Question:—A. Have never been nearer than a day's journey to the coast myself, so do not know much concerning the coast at the mouth of river, but as far north as Forts Norman and Peel and Good Hope the depth of water is great. Average length open water from 12th to middle of May, till first or second week in October. Excellent harbors, and think whaling or sealing vessels would have at least three or four months' fishing without being impeded by ice.

6th Question:—A. About 200 miles each side of the lake. Would consider all suitable for steam navigation with the exception of about 15 miles of rapid and portages between Mackenzie and Athabasca and just below Fort Athabasca.

8th Question:—A. One-half mile wide, great depth of water, five portages between Great Slave Lake and Fort Athabasca, one rapid about 20 miles long consider it navigable for 200 miles, and but for this rapid would have about 1,300 miles with the Mackenzie of navigable water to the coast.

10th Question:—A. Have never been up the Peace River far, so do not know much about it.

12th Question:—A. The Mackenzie the largest river in the district, about 2,400 miles long; extensively wooded on the banks; has good harbors and would be navigable five months in the year by any steamer or sailing vessel of ordinary size.

13th Question:—A. Along the shores of Lake Athabasca it is all timber, pine, spruce and tamarac of great size. Fish in great abundance, chiefly whitefish. Iron is to be found in that region pretty extensively. Cannot say for any other mineral, but should think coal is also plentiful.

14th Question:—A. The largest in the region, also thickly wooded, extensive fisheries. Great place for sulphur, iron is also found there, I believe. The same in Great Bear Lake in regard to timber and fisheries, consider it one of the best lakes in the world for fish of all sorts, but chiefly white.

17th Question:—A. Can ascend the Mackenzie between 1,000 and 1,200 miles between first of June and middle of October.

18th Question:—Cannot tell exactly as my experience is of 28 years ago, but understand the Hudson Bay Company have steamers plying at the present time on both these lakes.

21st Question:—A. Greatly similar to our Manitoba summer; warm, sunny weather, just enough rain for vegetation, snow in winter from 3 to 4 feet deep.

22nd Question:—A. At Forts Chippewyan, Resolution, Simpson and Halkett, frost penetrates from 4 to 5 feet; nearer the coast at Fort Norman and Good Hope about 5 feet, and so on towards the coast.

26th Question:—A. As far north as Fort Norman. I saw some wheat, very fine, at Portage la Loche, grown by an Indian, but do not know of its being tried further north then. Never saw any Indian corn during my stay.

29th Question:—A. At Athabasca, barley sown the middle of May, ready for reaping first or second week in August; further north, at Fort Norman, sown the middle of May, could be reaped middle or last week in August. Spring opens first of June or last week in May.

31st Question:—A. Usually about three weeks. Wheat ripens about the last week in August; barley the middle of August; potatoes the first of September; strawberries the middle of July; gooseberries the first of August.

33rd Question:—A. Lovely warm weather, thermometer ranging 70 to 80 degrees, neither too dry nor wet, much similar to Manitoba. No summer frosts in any of the places mentioned. No local frosts in these months.

37th Question:—A. Latter end of May.

38th Question:—A. September, warm, but frost often at night; October cooler with frost as a usual thing. The intensity of the winter cold does not retard growth in summer whatever.

40th Question:—A. Wild grasses most abundant and nutritious. Excellent for pasture and compare favorably with those of any of the eastern provinces.

41st Question:—A. Have not noticed it but may have grown among the rest.

42nd Question:—A. Did not know of any, but did not look for any, as I did not want it.

43rd Question:—A. Black loam chiefly, sometimes a little sandy. Three-fourths is fit for pasturage, and nearly the same for hardy grains.

45th Question:—A. Climate in winter intensely cold, but does not seem to affect plant life; in summer, weather beautifully warm, splendid growth, but season very short.

46th Question:—A. None whatever.

47th Question:—A. The postmasters of the different forts in the district could furnish you with records kept as to the climate in different parts. Did not keep any such myself, but by applying to men in charge now could supply you with all information wanted.

48th Question:—A. Decidedly they do, if it was not for the numerous lakes and rivers in the district, summer frosts would be the usual thing. These freeze in the latter end of October; open in spring, the latter end of May.

49th Question:—A. South wind chiefly in summer, which makes the air mild and warm. In winter, with the intense cold, there is never much of any kind, but chiefly north and south.

50th Question:—A. Fort Simpson, and upwards to Great Slave Lake.

51st Question:—A. In agriculture, when I was there, nothing whatever was done to any extent; stock raising at most of the forts was carried on on a small scale, and succeeds admirably.

52nd Question:—A. Have not seen much of what is called barren lands, and cannot say.

53rd Question:—The animals which now find sustenance there and elsewhere in the region in question, are as follows:—

Cariboo, of three kinds, red deer, reindeer, cabre; reindeer of great size, skin valuable for shoes, shirts, &c., greatly used by the men in the Hudson Bay Company. Musk ox abounds in the northern regions, but are not to be found in Mackenzie River district; robes very valuable. Moose, very numerous, large skins very useful for clothing and moccasins. Elk, never saw any during my stay. All other animals, except those which are carnivorous. Wild sheep and goats abound in mountainous regions. Flesh very good, but skins not much used.

NUMBERS, localities, quality of covering, habits, and method of capture of:—

Lynx, Very numerous about Great Slave Lake, but are to be found through the whole district; fur is good, valued at 3s. per skin; captured in wooden traps.

Arctic fox, found towards the coast; fur of not much value.

Black fox, pretty numerous throughout the district; fur very valuable; skins worth from £6 to £8.

Silver fox, almost same as black, but fur not quite so valuable: usually captured in steel traps.

Cross fox, most numerous but not so valuable; captured same manner.

Fisher, found in the mountains something similar to lynx, but fur more valuable.

Wolverine, very numerous, of no value.

Otter, not very numerous, chiefly I think, on account of cold; fur most valuable, often shot in water or caught when seen on land.

Beaver, very numerous all through the country; fur very valuable; captured by breaking their houses, afterwards spearing, trapping or shooting them.

Marten, most numerous, also all over. Fur valuable, caught in steel traps.

Mink, not so numerous as marten; fur about as valuable; found in little streams and captured in traps.

Ermine very plentiful; of no consequence.

Musk rat, thick as mosquitoes; fur valued at 6d per skin.

55th Question:—A. Can't tell the amount of shipments of late years, postmasters at the present time would be able to furnish information on that subject.

57th Question:—A. White is the principal, and in the lakes and rivers most plentiful. On one occasion I remember in one day with another man taking 2,500 at Great Slave Lake, these weighing from four to five pounds each, of the best quality, and this was not an unusually large number to be taken in nets. Come about the same every year, especially in the fall are most numerous, are caught till 1st of February. Trout are also numerous, very large, weighing often 30 or 40 pounds, caught by hooks in the spring by holes cut in ice. Pike most numerous, weight 12 to 15 lbs. Almost every kind of fish are to

be found in these lakes and rivers; in fact I think nowhere in our eastern provinces are there such valuable fisheries.

58th Question:—A. Never saw but small whales and grey seal, which are most numerous, but understand large whales abound along the coast.

59th Question:—A. Should think these fisheries most valuable and small vessels of 100 or 200 tons if built strongly, either at the head of the Mackenzie or any of the posts near the mouth, would be most suitable.

60th Question:—A. Timber there is large enough, but chiefly pine, spruce, tamarac and poplar, and might not be hard enough for construction of vessels. Great tracts of timber are to be found along the Mackenzie, Peace and Athabasca and throughout the whole district; spruce, birch, tamarac, poplar, are chief, larger size spruce often measuring 4 to 5 feet diameter. Think the only way of bringing such to market is by railway connection.

63rd Question:—A. Know of none but a sort of white cherry used by the Indians to make bread.

65th Question:—A. All over the region used greatly by Indians and often at Hudson Bay posts when other not to be had.

66th Question:—A. Is rather bitter, but would make a good substitute. It is very wholesome.

67th Question:—A. Regarding gold, have heard of it, but have never seen it. Iron could be found throughout the whole country, very plentiful on the shore of Great Slave Lake, running into it by little streams. Should think would be plentiful, but have never seen any. Coal in great abundance in banks of Mackenzie, and elsewhere. Saw there a fire burning, which the oldest inhabitant could not remember starting, and is burning, I believe, to this very day.

68th Question:—A. White clay on the Mackenzie most valuable for pottery. Quantities of lime and sandstone, while granites are found all over the district.

70th Question:—A. Pretty far north, but some stay in the barren grounds in great numbers; white and gray wavey, crane, swan, geese and ducks all in great numbers; date of hatching, last of June; arrived middle of April, seen as early as 12th, leave in September and 1st of October.

71st Question:—A. Goose, duck, swan, wavey and crane in great numbers. Feathers in great quantities turned out of this district generally by Hudson Bay Company.

72nd Question:—A. During the migrations, the birds in these districts do not stop long to feed, but geese and ducks hatch throughout the whole country and stay all summer.

73rd Question:—A. The different varieties of food of these migratory birds during the breeding season are grass, gravel, berries, which is the chief food of them all.

74th Question:—A. The time of their appearance in the spring going north is between 12th and 20th April, and middle and 1st October leaving.

75th Question:—A. The usual food of these wild fowls after the hatching season is over is the same as during hatching season.

76th Question:—A. Raspberry, strawberry, gooseberry, "very large" cranberry (high and low bush), a splendid region for small fruits.

77th Question:—A. Pitch is splendid, flowing into the river by little streams; very valuable for boats.

78th Question:—A. There are large quantities of this deposit for forty or fifty miles.

79th Question:—A. Should petroleum be discovered in large quantities by boring wells in the Athabasca region, should think that small steamers to where connection by rail might be made, would be the best way of bringing it to market.

82nd Question—A. Chippewyans about Athabasca and Slave down the Mackenzie, Indians nearer the coast and Esquimaux at the mouth. Consumption from cold is what carries off most of them. Know of no other epidemic disease.

83rd Question:—A. Fish, venison, fowl, fresh in summer, dried for winter, rabbits, bear and pemmican is the food used by them at different times of the year. Do not make any effort to cultivate soil; live altogether by the chase.

84th Question:—A. Can't say; the scarcity of moose and deer some years is owing I think to the depth of snow, the winters before, when greater numbers than usual were killed.

85th Question:—A. Cannot account for the cause and nature of disease which periodically kills off rabbits, suppose it is natural.

86th Question:—A. Only one variety of rabbit in Mackenzie Basin.

87th Question:—A. All rabbits are equally subject to this disease.

88th Question:—A. Food animals: black bear is numerous and easily killed; grizzly bear is found in the mountains and are more savage.

89th Question:—A. The effect of the opening up of the Mackenzie Basin to civilized men upon the Indians of the region would be I think beneficial, as it would teach them agricultural pursuits, stock raising, &c.; they are honest and mild until you come to the Esquimaux, who are more savage.

90th Question:—A. The Indians are good workers, employed greatly by the Hudson Bay Company as boatmen and make excellent servants. Helps to civilize very greatly; not difficult to get them to work to support themselves.

If any exploring parties are sent out would much like a chance to go.

DONALD McIVOR,

Kildonan, Man.

SMITHSONIAN INSTITUTE,

UNITED STATES NATIONAL MUSEUM,

WASHINGTON, 26th April, 1888.

JOHN SCHULTZ, Esq., Senate Committee Room,
Ottawa, Canada.

SIR,—I have received your communication of 10th April with enclosures in reference to the appointment of a Senate Committee to enquire into the resources of the Great Mackenzie Basin, and requesting information relative to that region. In reply I regret to have to inform you that there is no one connected with this Institution who from actual experience feels capable to answer the questions submitted.

Yours very respectfully,

S. P. LANGLEY, *Secretary.*

457 ST. PAUL ST., MONTREAL, 30th April, 1888.

DEAR DR. SCHULTZ,—In reply to your telegram of this day—the Hudson Bay Co. sell all their furs in London. About the end of January in each year they sell the beaver and musk rat. About the beginning of March is the principal sale of all various skins. In September they have a clearing up sale of skins comprising all that have been received through the summer; about the same time they also sell all the odds and ends such as eider down, feathers, fish oil, bees' wax, &c.; the September sale will probably average from one-third to one-fourth the amount of the March sales. Lampson & Co. sell at the same time as the Hudson Bay Co.—and also for some three or four years have sold furs in June; in addition to this they sell the Alaska collection of seal skins in April and November.

I think this will cover all your questions; if not, I shall be happy to try again. I think my son Horace will be in Ottawa to-morrow, he will call on you and you may possibly extract some information from him.

Faithfully yours,

JOHN MARTIN.

Hon. Dr. SCHULTZ, Ottawa.

OTTAWA, 30th April, 1888.

SIR,—I am directed by the Select Committee of the Senate appointed to inquire into the resources of the Great Mackenzie Basin to forward you the enclosed list of questions, as His Lordship, Bishop Clut, in his examination before this Committee, informed them that you possess valuable information in regard to the region embraced in the inquiry, particularly in regard to the sea animals in the Arctic Sea and at the mouth of the Mackenzie River; and the Committee would like to have fuller information in regard to this latter subject than they have yet been able to obtain. If you feel it too great a task to answer all the questions enclosed, perhaps you will be able to particularize that in regard to the sea animals. The Committee and the country will appreciate very highly any information you can furnish on this point.

I have the honor to be your most obedient servant,

JAMES DRYDEN, *Secretary.*

Rev. FATHER SÉGUIN,
Fort Good Hope, Mackenzie River.

ST. PETER'S CHURCH, 107 VISITATION STREET, MONTREAL, 2nd May, 1888.

DEAR SIR,—I am in receipt of your letter of the 30th April. I have hastened to send to Rev. Father Jean Séguin, at Good Hope, the list of questions on the Mackenzie Basin, series "A," "B" and following. I hope that the Rev. Father will reply in a manner that will be satisfactory to the Committee. I have requested him to have the goodness to send you the degrees of cold and of heat of which he has taken note during twenty-seven years. As this will involve a good deal of work for this gentleman whose time is very much occupied, I have asked him to send you the degrees of heat and cold noted for four or five years only. That will be sufficient for you I hope, to give you an idea of the temperature at Good Hope.

In the Committee room you expressed to me a desire to obtain the addresses of missionaries who would be able to give you information. Well, I send you here the addresses of the heads of the missions, and if you wish to send them your list of questions I most cheerfully authorize you to do so :

1. Rev. Père E. Girouard, O.M.I., Vicar-General, Lac la Biche, *via* Calgary and Edmonton, N.W.T.
2. Rev. Father Albert Pascal, O.M.I., Mission of the Nativity, Athabasca, *via* Calgary, &c.
3. Rev. Father F. Le Serrec, O.M.I., St. Charles' R.C.M., Dunvegan, Peace River, *via* Calgary, &c.
4. Rev. Father A. L. Laity, O.M.I., St. Henry's R.C.M., Vermillion, Peace River, *via* Calgary, &c.
5. Rev. Father L. F. Dupire, O.M.I., St. Joseph's R.C.M., Great Slave Lake, *via* Calgary, &c.
6. Rev. Father Nouet de Berangue, St. Raphael's R.C.M., Fort Des Liards (Mackenzie District) *via* Calgary, &c.
7. Rev. Father A. Lecorre, O.M.I., Superior of R.C.M., Providence (Mackenzie River), *via* Calgary, &c.
8. Rev. Father B. Roure, O.M.I., St. Michael's R.C.M., Fort Rae (Mackenzie District), *via* Calgary, &c.
9. Rev. Father J. J. Dupin, O.M.I., St. Bernard's R.C.M., Petit Lac des Esclaves, *via* Calgary, &c.

May these addresses be useful to you !

I am, dear sir, yours very truly,

IS. CLUT, O.M.I., *Bishop of Arendele.*

Mr. JAMES DRYDEN, Secretary Committee, Ottawa,

SENATE COMMITTEE ROOM, OTTAWA, 17th May, 1888.

The Honorable the Minister of Interior,
Ottawa.

SIR,—At a meeting to-day of the Joint Committee on printing of both Houses of Parliament, I was instructed by its chairman to add to the report on the Mackenzie Basin, which came in due course before them, a map showing Alaska and the coast line between Alaska and the mouth of the Mackenzie River, and to place upon it all information which we had derived from the evidence or from other reliable sources, in regard to such navigation as had obtained in the past by Polar Sea ship, boat, and Hudson Bay Company's expeditions, the size of the map to be that which will form two pages of the report when in print. In compliance with this request I have to ask you to be good enough to cause to be prepared such a map, which I shall submit to my colleagues, and on their approval of it I will communicate with you again. The information given in the Admiralty chart showing Behring Straits, the north coast of Alaska, and the north coast of the North-West Territories, is essential as forming a basis of the coast line and the soundings thereon. It will be necessary also to put upon the map the track of Captain McClure; also that of Captain Collinson, as shown in the chart which you will find in Vol. No. 475 of the library, entitled the "Discovery of the North-West Passage by H. M. S. "Investigator," Captain McClure," marking also all of the points, inlets and also coast marks which are there named; also the track of the boats of Her Majesty's storeship "Plover" from near Point Barrow, skirting the north-west coast of America and ascending the Mackenzie to Fort Simpson; also the track of the boats of Dease and Simpson, who descended part of the Mackenzie and took up the survey of the coast from Franklin's western limit of coast survey at Return Reef. You will also please have Franklin's route laid down, and from any or all of these sources give any of the soundings which relate especially to the Mackenzie estuary and the coast west of that river.

I am, sir, yours respectfully,

JOHN SCHULTZ, *Chairman.*

(Extracts from different records having reference to map showing sea-coast of Alaska and North-West Territories from the "North-West Passage."—Robert Huish.)

Page 330.—Mr. Martin also reported that the water is exceedingly shallow off and about Escholtz Bay, and that although the summer had been a most favorable one in every respect for a vessel coming through, yet the depth of water is wanting. This, together with the north-east current and the prevalence of the south-west winds, renders the North-West Passage decidedly unattainable.

Page 412.—To the northward of Point Barrow the sea appeared encumbered with lofty icebergs, but on the western side there was a fine open channel, which the Esquimaux assured the party extended uninterruptedly to the southward. They likewise informed them that whales were plentiful to the northward of the point, and seals were everywhere sporting among the ice. Observations were obtained, which determined the landing place to be in latitude $71^{\circ} 23' 33''$ north, longitude $156^{\circ} 20'$ west, agreeing closely with the previous observations of Mr. Elson on his visit to the place. It was high water between one and two o'clock, the rise of the tide being fourteen inches with the flow from the westward. After bidding adieu to their good humored and friendly entertainers, the party set out on their return and reached the mouth of the Mackenzie River on the 17th August, and finally Fort Norman, from whence they departed on the 4th September, having thus successfully completed the survey of sixty degrees of coast line of the American continent, which had hitherto remained a blank on the map of the Arctic shores, being a part of the 160 miles of sea coast which it may be remembered intervened between the farthest points reached by Captain Franklin in 1825, and that attained by the master of

H. M. S. "Blossom," who was despatched in boats to meet him from Behring Straits.

After much difficulty, arising from the broad and heavy pack of ice that rested on the shore, at length reached the Point; and were rewarded for all their toils and anxieties by the sight of the open sea stretching away to the southward. On Point Barrow, which is a long low spit, composed of gravel and coarse sand, which the pressure of the ice had forced up into numerous mounds, resembling in appearance huge boulder rocks, Mr. Simpson and his party hoisted their flag and with three loud and hearty cheers took possession in the King's name.

Page 408.—The latitude ashore was $70^{\circ} 9' 48''$. From this situation they had the satisfaction of seeing a range of the Rocky Mountains to the westward of Romanzoff chain, and not seen by Sir John Franklin, though within the limits of his survey; Messrs. Dease and Simpson therefore called it the Franklin Range, as a just tribute to his character and merits. That evening they reached Sir John Franklin's Return Reef, where their survey commenced, that officer having got no further. Return Reef is one of a chain of reefs which run for 20 miles parallel to the coast, at the distance of about half a league, affording sufficient depth of water within for small craft. The mainland here is very low. Harrison's Bay, which is about fifty miles in breadth and about a third of that in depth, extends from Point Berens to Cape Halkett. At the bottom of this bay another picturesque branch of the Rocky Mountains rears its lofty head, to which they gave the name of Pelley's Mountains, in honor of the Governor of the Hudson Bay Company. At their base flows Covill's River, which is two miles wide at its mouth, and here the travellers were detained for a whole day by a violent gale from the north-east. The country, to the foot of the mountains, appeared to consist of plains clothed with low grass and moss, affording pasture for herds of reindeer. Observations were taken here, which determined Cape Halkett to be in latitude $70^{\circ} 43' N.$, longitude $152^{\circ} 14' W.$, the variation of the compass $43^{\circ} 8' 33'' E.$

The following is from "Richardson's Polar Regions:"

Page 235.—To the westward of Bank's Land, at some distance seaward from the American continent is found the permanently ice-blocked sea, called by the Eskimos "the land of the white bear." This gigantic floe we believe to be formed by the continued eastern set of the deep tidal and oceanic currents of the Polar Sea east of Spitzbergen, and that it is prevented from permanently blocking up the coast line of the American continent only by the influence of the rapid tides which enter the Polar Sea through Behring Straits.

Page 239.—Baron Wrangell's description of the sea ice north of Kolyma, already quoted, will apply generally to the ice of the north of America, but though there are high hummocks or ridges where currents or strong winds have pressed the floes and smaller pieces together, and caused them to over-ride each other, there are no icebergs of any size in the Arctic American Sea, from the absence of glaciers to furnish them, either on the continental shore or islands due north of it. The nearest approach to an iceberg on the American coast line is a talus of drift snow formed under a precipitous cliff washed by the sea, which breaks off by the action of the waves and sun after one or more summers. They are few and comparatively insignificant when contrasted with the mountain bergs furnished by the vast glaciers of Greenland and Spitzbergen.

Page 240.—Sir Robert McClure and Captain Collinson in the voyages from Behring Straits to Bank's Land, obtained information of the fixed barrier of ice already noticed as distant from thirty to fifty miles from the continent. It is probable that this ice belt hangs on to a northern chain of islands.

Page 241.—About the end of September fresh ice begins to encrust the surface of the sea, so as to terminate the general navigation for the season, and the history of Arctic enterprises in the earlier pages of this work, shows in certain localities, and in some seasons, the ice may be packed by prevailing winds and currents so as to obstruct the progress of ships for a whole summer, or even for several successive years.

Page 128.—Cook's careful examination of the American coast, from the 58th parallel of latitude northwards proved that there was no passage below Icy Cape, which was the limit of his voyage within the Behring Straits. The Russian surveyor Gwosden had seen the American side of Behrings Straits in 1730, and Behring Tehirikow and De Lisle had rounded the peninsula of Alaska, and touched in 1771 the mainland near Mount St. Elias, as well as in latitude $55^{\circ} 30'$. But Cook was the first who made a continuous and effective survey of those coasts. The failure of Phipps in the Spitzbergen seas, of Cook by way of Behring Straits, and of the vessel sent on two successive seasons to Davis' Straits, to co-operate with him, satisfied the Admiralty of the day, and for 40 years the North-West Passage was unheard of in the Government bureaus.

In 1789 Sir Alexander Mackenzie, a member of the North-West Fur Company, trading from Canada, descended the great river which bears his name, and traced it to its termination in the Arctic Sea, though this traveller says that he was not supplied with the necessary books and instructions, and with much modesty adds that he was deficient in the sciences of astronomy and navigation. His survey was in the main highly creditable, and the position of Whale Island, his extreme point, is very nearly accurate. He had actually reached the sea coast, but the Mackenzie pours out such volumes of fresh waters from its various mouths that the sea does not become salt till near Garry Island, which lies about thirty miles out from the coast of the river Delta. The rising of the tide, was, however, observed. The latitude of Whale Island was found to be $69^{\circ} 1' 4''$ by meridional observations to sun, and its longitude by dead reckoning 135° west. Before leaving the island many Belugas or white whales were seen, whence the name given to the island by Mackenzie.

Page 181.—Before Captain Kellet made this discovery he had despatched Lieutenant Pullen and Mr. Hooper, with two whale boats to search the coast between Port Barrow and the Mackenzie. They were convoyed beyond the point by the "Nancy Dawson," Mr. Sheddon's yacht. The voyage to the Mackenzie was successfully made, whereby in conjunction with Sir John Richardson's and Dr. Ray's boat voyages above mentioned, the whole continental coast line between Behring's and Victoria straits was examined without any trace of the "Erebus" and "Terror" being found. After wintering on the Mackenzie, Lieutenant Pullen tried, in 1850, to reach Bank's Island, but got no further than Cape Bathurst.

It will be remembered by those who have read the interesting narrative of Captain McClure's voyage in the "Investigator" that having reached the neighborhood of Port Barrow without seeing or hearing anything of his consort, the "Enterprise," and after consultation with Commodore Moore of the store-ship "Plover" near Port Barrow for the purpose of aiding Sir John Franklin's ship should he be able to reach that point from the east as was his intention, or to afford such aid to expeditions trying to attain a north west passage from the west to the east, that fearing he might not be able to reach open water if he delayed, it was determined that he should proceed, and in writing to the secretary of the Admiralty on the 20th July, 1850, he mentions among other matters:

1. After passing Cape Lisburne, it is my intention to keep in the open water, which from the different reports that I have read, appears about this season of the year, to make between the American coast and the main pack as far to the eastward as the 130th meridian, unless a favorable opening should earlier appear in the ice, which would lead me to infer that I might push more directly for Bank's Land which I think is of the utmost importance to thoroughly examine.

They fell in with a boat containing three Esquimaux, who, "in reply to the queries made to them, held out the gratifying promise of a channel of water being found continuously to the east, and that at this season it would vary from three to five miles, the distance to pack then lay off Point Pitt. The ice they said never went further off than at the present time and at one season (that is in the winter) there was no water at all along the coast. They could give no idea of when the water ceased to exist or when the winter season may be said to commence in this region."

It is almost immediately afterwards incidentally observed that "the coast of North America in this neighborhood is described as one vast plain; the soil is a dark blue clay, without a stone or elevation to break its strange monotony. From the beach the eye ranges over an immense green flat, variegated with moss, grass and flowers, and broken here and there by fine sheets of fresh water. Large herds of reindeer were seen by the "Investigator" and the whole landscape was strangely novel to our navigators and totally unexpected in the near neighborhood of a sea of eternal ice. The bottom of the sea partook of the level nature of the land, and the soundings were wonderfully regular, enabling the "Investigator" to work along in spite of flying mists, by alternately standing into three fathoms of water and off to six or seven, where they generally found the edge of a heavier ice brought up and aground. Its enormous thickness may be estimated by considering that to be aground in seven fathoms of water the flocs must have ranged from thirty-five to forty feet in depth; and this, of course, being the outer edge of the pack, was lighter than the rest. They seem to have advanced eastward along between the pack of the shore, generally beating against head winds, of sea smooth, and on the 10th this changed to a fresh fair westerly breeze, and the distance widened between the pack and the shore, and they endeavored to steer a straight course for Bank's Land, the sea seeming clear before them. At noon they had sounded 190 fathoms without obtaining bottom, but shortly afterwards they discovered that it was a trap off the mouth of the Mackenzie River where open water extended ninety miles away from their ordinary course. They had to return, and they steered a course outside the Pelley Islands which lie off the mouth of the Mackenzie and 50 miles distant from the mainland. At 10 a.m. the ship passed distinctly athwart the stream of the Mackenzie over-running the sea-water. The temperature of the water rose from 28 to 30 degrees Fahrenheit. The current is as muddy as the Thames at Woolwich and its taste only slightly brackish. It was during this digression from a straight eastward course that Captain McClure missed seeing the boat's crew of Commander Pullen, who passed him on a return homeward from a visit to Cape Bathurst. That officer having left the storeship "Plover" the year before skirted the North American coast and descended the Mackenzie to Fort Simpson, where in the spring he fitted his boats for an advance eastward of the Mackenzie along the coast, but the easternmost point reached by him was Cape Bathurst. After passing the Pelley Islands whales were seen in considerable numbers; and unwilling and wishing to communicate with England before finally entering the pack which he expected to meet beyond Cape Bathurst, he landed with a letter and endeavored to induce the Bequimaux to take it to one of the Hudson Bay Forts upon the Mackenzie for transmission to England. They did not seem willing to accept the commission, and when asked (see page 88) why they did not trade with the white men up the big river, the reply was that they had given the Indians water which had killed a great many of them and made others foolish, and they did not want any more of it. After passing Cape Bathurst and near the mouth of Horton River they discovered a smoking cliff at the bottom of Franklin Bay (p. 101). "The fires proved to be volcanic, and issued in smoke strongly impregnated with sulphur from 15 different cone-like apertures resembling limekilns. Dr. Armstrong collected a considerable quantity of specimens of earths and minerals, in which the place was rich. The general appearance of the land was flat, though rising in places to an elevation of 300 feet to 500 feet, and intersected with ravines, exhibiting clay. The volcanoes were about 50 feet above water, and situated on an old landslide, not unlike the undercliff of the Isle of Wight; some pools of water near these volcanic cones were strongly impregnated with copperas; and altogether the testimony of our voyageurs would lead to suppose that the subterranean fires at this spot have a different origin to those found existing here and there, in about the 56th parallel of north latitude, or the western side of the Rocky Mountains, where such fires are generally imputed to the substratum of coal having caught fire by spontaneous combustion."

In a letter from Lady Franklin to the Admiralty regarding the advisability of the continuance of the search for her husband by way of Behring's Straits are these re-

marks: "Regretting deeply that you have, as I learn, come to a decision adverse to the immediate starting of a vessel by the eastern route, since I fully recognize the possibility of following my husband's track on that side down Peel Channel, I may yet be permitted to express the opinion I have long entertained, confirmed as it is by that of your late eminent hydrographer, Sir Francis Beaufort, and, by that of Capt. Collinson and McGuire, that the route of Behring's Straits, though longer in distance, is of surer and safer accomplishment, and that a vessel despatched this autumn to Behring's Straits would probably arrive at the spot to be searched in a shorter time than by the other. Capt. Collinson, whose experience is the highest that can be adduced on this point, has no doubt that he could carry even such a heavy sailing ship as the "Enterprise" without the aid of steam, in one season only, to the very locality where the remains of the "Erebus" and "Terror" are probably now lying, and where it is at least certain that the Esquimaux hold the secret of their fate, and of the pillage they have acquired from the catastrophe."

In a memorial from Sir Roderick Murchison upon the same subject he speaks thus: (p 394) "In respect to one of these courses, or that by Behring's Straits, along the coast of North America we know that a single sailing vessel passed to Cambridge Bay within 150 miles of the mouth of the Back River, and returned home unscathed, its commander having expressed his conviction that the passage in question is so constantly open that ships can navigate it without difficulty in one season."

EXTRACTS

From "Chemical Contributions to the Geology of Canada. From the Laboratory of the Geological Survey. By G. Christian Hoffmann, F. Inst. Chem., Chemist and Mineralogist to the Survey. 1883."

BITUMINOUS SAND-ROCK AND MINERAL TAR OR MALTHA.

From the Athabasca or Elk River, North-West Territory.—With reference to the geological position and general mode of occurrence of the above, Dr. R. Bell informs me:—

"That the deposit is of cretaceous age, but rests directly upon limestone of the Devonian system. The bedding of the latter undulates gently, while the asphaltic sand lies in thick horizontal layers upon its surface, and in some cases fills fissures in the upper part of the limestone. The asphaltic matter has no doubt resulted from petroleum rising up out of the underlying Devonian rocks, in which evidence of its existence can be detected. In descending the Athabasca River it was first observed a few miles above the junction of the Clearwater branch, below which it becomes more conspicuous, forming the whole banks of the stream, with the exception of a few feet of limestone at the base, for a distance of many miles. These banks are sometimes about one hundred and fifty feet in height, and frequently maintain an elevation of about one hundred feet for considerable distances. Except where they have been long exposed to the weather, they generally look as black as coal. A thick tar is often seen draining out of the deposit, and in numerous places on the ground at the foot of either bank, or on terraces lower than their summits, this tar collects in pools or flows in sluggish streams to lower levels among the peaty materials in the woods. The surface of these accumulations of tar is usually covered with a hardened pitchy crust. The boatmen on the river break through this crust in order to collect the underlying tar which they boil down and use for pitching their craft. Some parts of the banks are rendered plastic *en masse* from being over-saturated with the asphalt, and in warm weather they slide gradually down into the bed of the river, incorporating the boulders and pebbles in their course."

BITUMINOUS SAND-ROCK.

From the Athabasca River, about six miles below its confluence with the Clear-water; collected by Dr. R. Bell. This specimen was compact and homogeneous in appearance, of a dull, dark, brownish-black color. Specific gravity at 60° F. 2.040. At the temperature of 50° F. it is quite firm, barely, if at all, yielding to pressure, and does not soil the hand; at 70° F. it gives somewhat to the touch, and is slightly sticky; at 100° F. it becomes quite soft, and eminently soils the fingers. It is scarcely acted on by alcohol in the cold, and but very slightly at a boiling temperature; but ether, oil of turpentine, kerosene, benzine (petroleum spirit), benzol (coal-tar naphtha) and bi-sulphide of carbon, more especially the last two named, readily dissolve the bituminous matter, with formation of dark-brown colored solutions, and leaving a pure, or almost pure, siliceous residue in the form of sand, of which apparently the bitumen had constituted the sole binding medium.

The composition of this specimen of the rock was found to be as follows:—

Bitumen.....	12.42
Water, mechanically included.....	5.85
Siliceous sand.....	81.73

100.

The sand consisted of colorless transparent quartz, not unfrequently presenting the bright glassy lustre of broken quartz crystal; the surfaces were, however, for the most part, more or less dulled by abrasion: it contained a few flakes of silvery mica, and, as Mr. Adams—to whom I handed a small quantity for microscopical examination—informs me, an occasional fragment of felspar. It is on the whole exceedingly fine, 52 per cent. of the same passing a sieve of ninety meshes to the linear inch; 16 per cent. one of seventy-five meshes; 15 per cent. one of sixty-six meshes, and 9 per cent. one of fifty meshes, leaving a balance of 8 per cent. as rejected by the latter.

Subsequent to the foregoing examination Mr. A. S. Cochrane, of this survey, handed me a specimen which he collected, and which differs from the above in that it does not appear to contain so much water, and the bituminous matter partakes more of the nature of asphalt. At the temperature of 65° F. it is quite hard, fragments may be chipped off with a hammer, and it is reducible in a mortar to a non-coherent pulverulent condition; at 100° F. it barely yields to pressure, and is only slightly adhesive; at 150° F. it gives to the touch and is somewhat sticky; at 200° F. it is quite soft, and may be readily moulded.

MALTA OR MINERAL-TAR.

From the right bank of the Athabasca, about twelve miles below its confluence with the Little Red River; collected by Mr. A. S. Cochrane.

This material also occurs at several other points further down the river, and is identical with that referred to in the prefatory remarks.

The sample in question had a pitchy-black color in thin layers, and by transmitted light, rich, dark, reddish-brown. The specific gravity at 60° F. was found to be 1.023; at this temperature it has the consistence of a soft extract, and will barely flow; at 70° F. flows, but sluggishly, whilst at 100° F. it has the consistence of treacle.

As regards the utilization of these substances, the most appropriate application of the former and that for which it would appear to be admirably adapted, would be for asphaltting purposes. It has one of the most important qualifications of a good bituminous concrete, viz., intimate combination of the mineral and organic constituents, and this in a degree which no artificial preparation of the kind could be expected to possess. It will in all probability be found that a very slight treatment will render it suitable for employment in the construction of roads, foot-paths, court-yards,

&c., for asphaltting the flooring of granaries, basements of warehouses, and the like, and further as a roofing material. Should it be deemed more expedient to separate the bitumen, this may be effected by simply boiling or macerating the material with hot water, when the bituminous matter entering into fusion will rise as a scum to the surface and may be removed by skimmers, whilst the sand falls to the bottom of the vessel.

An experiment was made in order to ascertain the greatest state of purity to which the bitumen could be brought by this method; it was found that of the 81·73 per cent. sand, 69·26 per cent. had been removed, the extracted bitumen containing 50·1 per cent. sand, and—owing to the extreme fineness of a portion of this latter, as already mentioned—it may be questioned if the purification by this method could be pushed much beyond this.

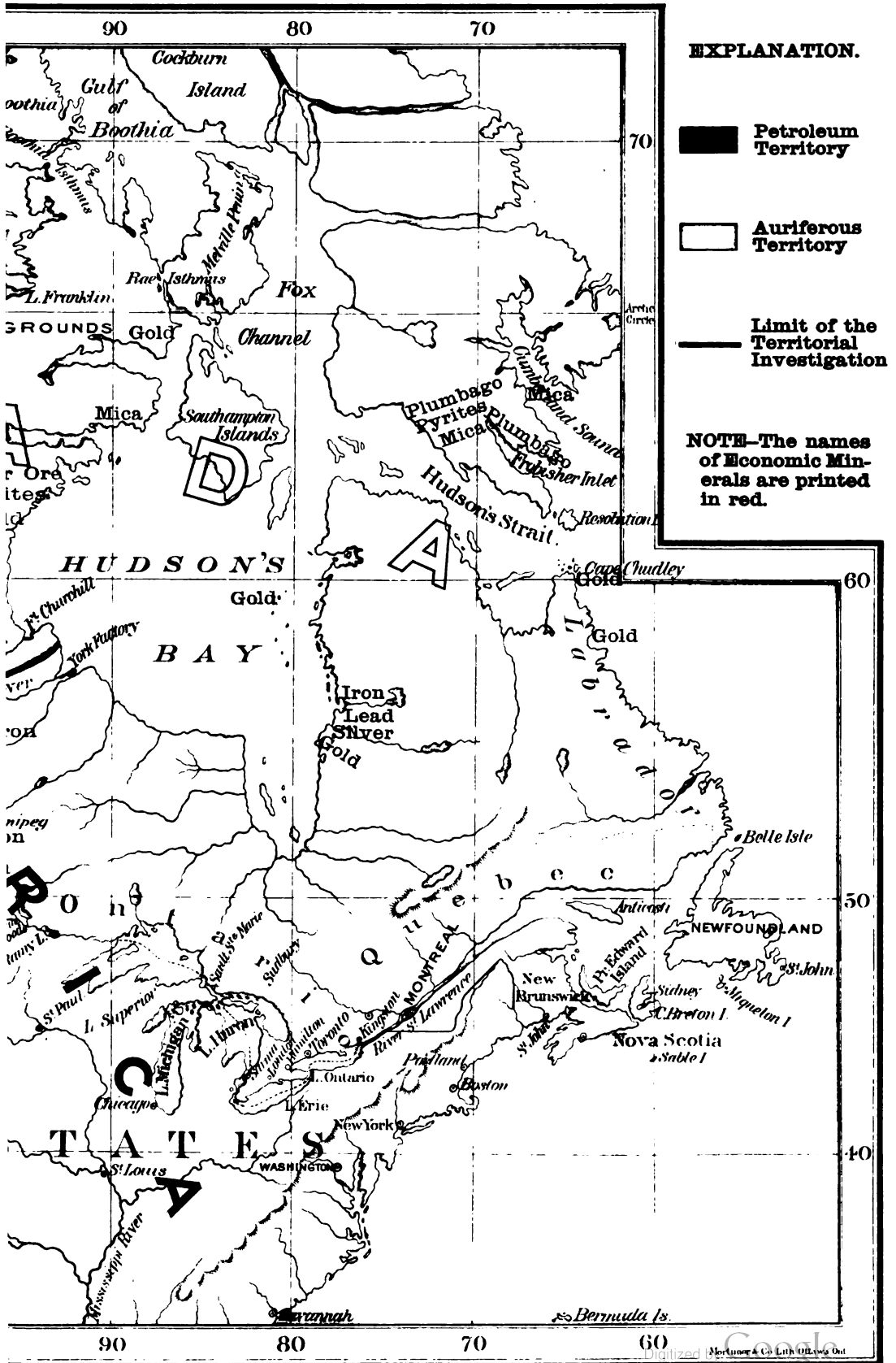
The sand separated by this process, when carefully conducted, is free or almost free from bitumen, and might, after being heated to redness in a reverberatory furnace—to destroy any little adhering bitumen—be advantageously employed for the manufacture of one of the better qualities of glass.

The above treatment requires but the simplest of appliances, and might be readily carried out on the spot.

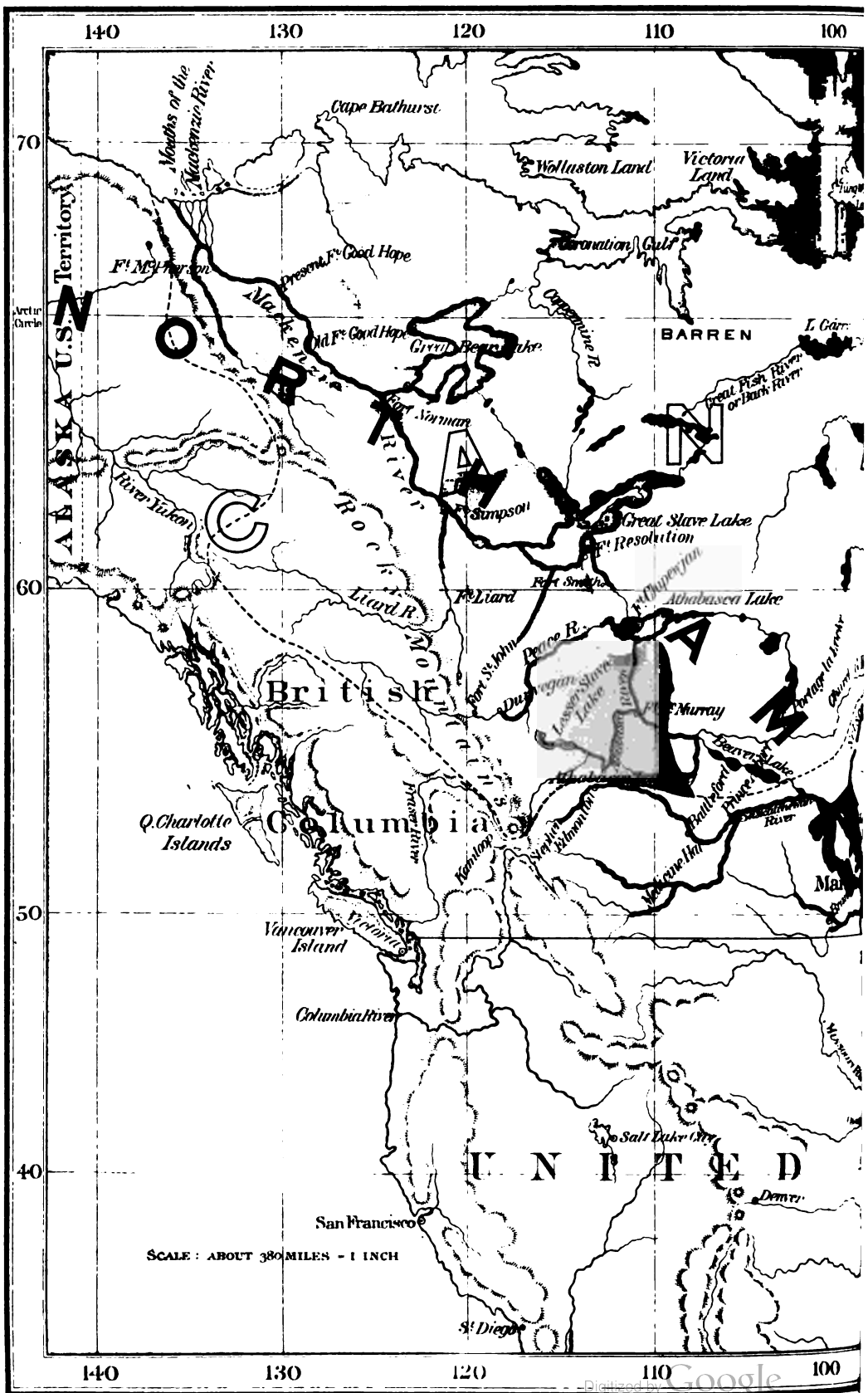
The amount of maltha at my disposal was far too small to warrant any attempt at its distillation. Should it occur in sufficient quantity it might possibly, amongst other uses, be advantageously employed as a crude material for the manufacture of illuminating and lubricating oils and paraffin.



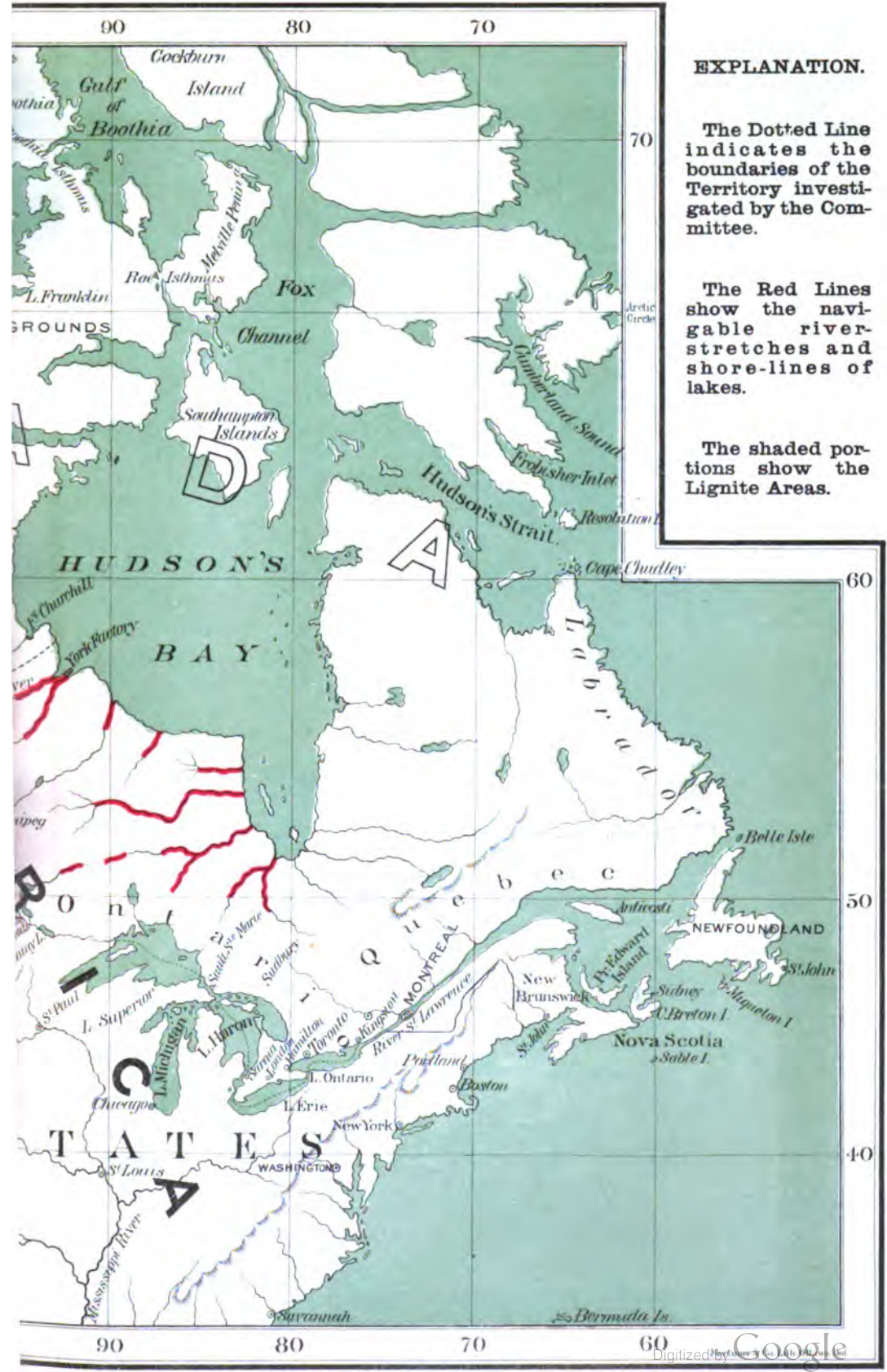
1 Resources of Great Mackenzie Basin.



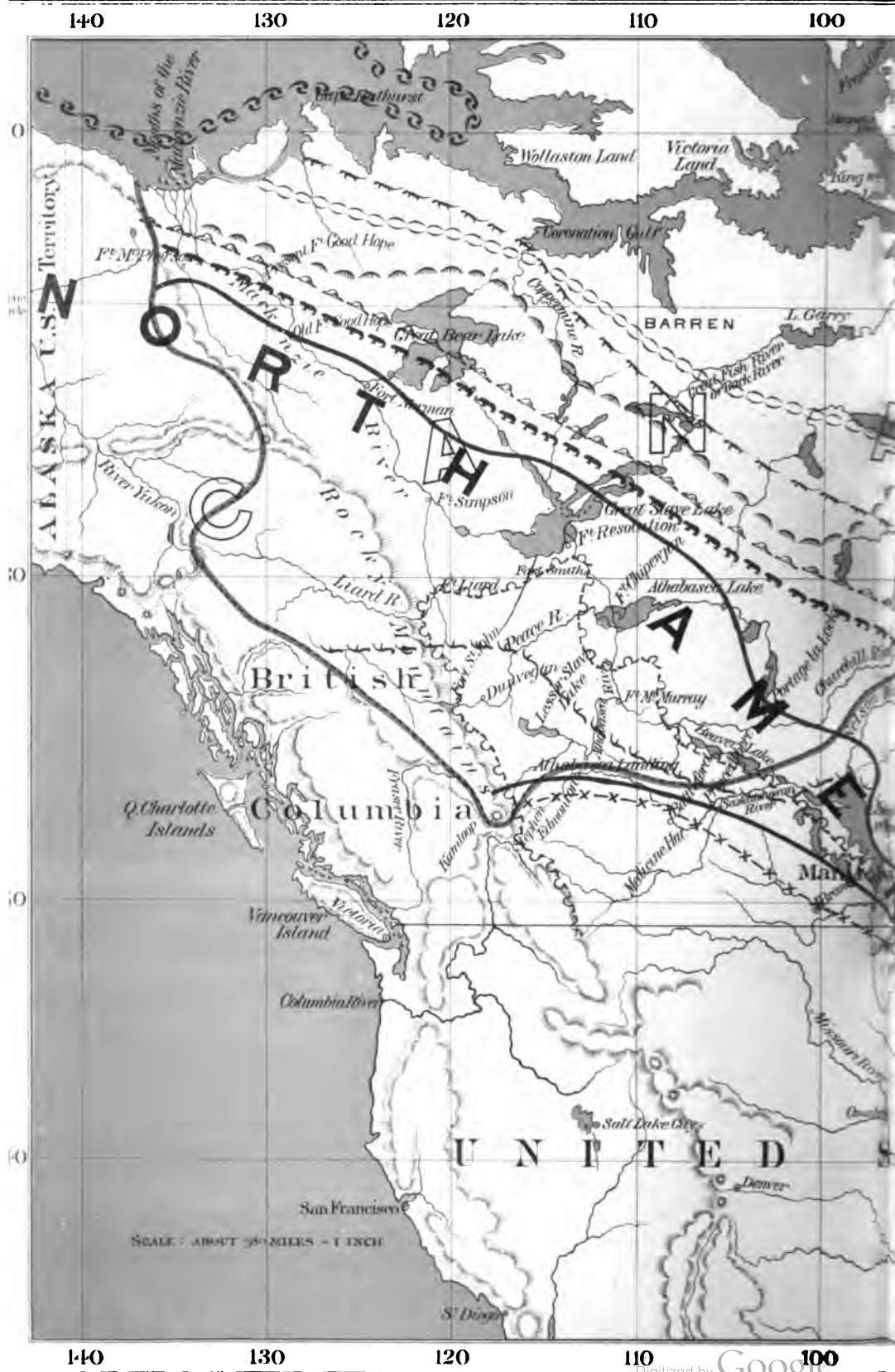
MAP showing the Navigable Waters and the Li



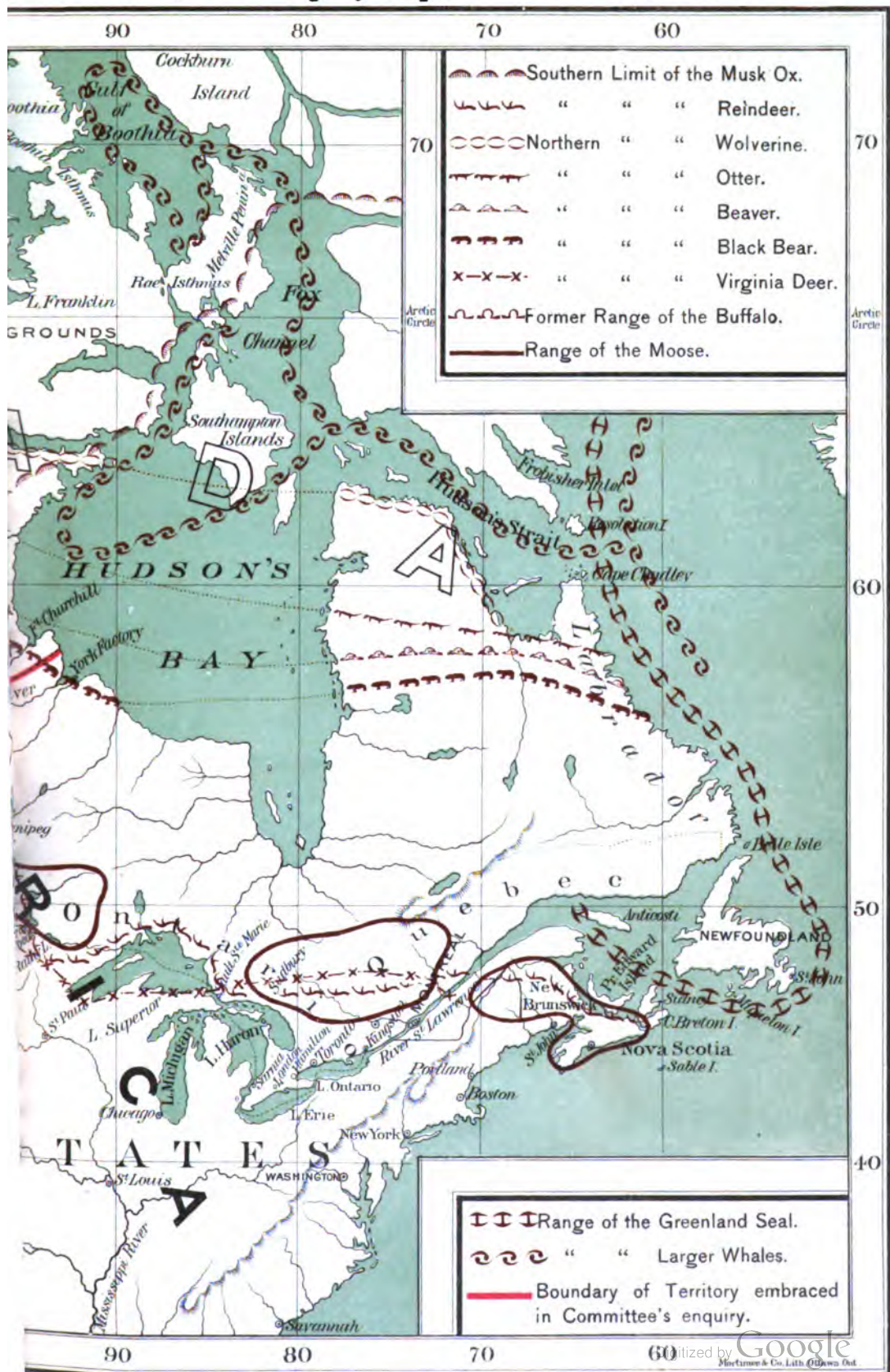
ite Areas of the Mackenzie Basin.



MAP showing Geographical distribution of the principal Canadi



on Mammals, to accompany Report on Great Mackenzie Basin.



MAP showing the Barren Grounds, Arable and Pasture Lands, Northern Lim

Prepared by Robert Bell, B. A. Sc., M. D., LL. D., Assistant Director of the



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REPORT
OF THE
SELECT COMMITTEE OF THE SENATE

**APPOINTED TO ENQUIRE INTO AND REPORT UPON
THE EXTENT AND EFFECT UPON THE OTTAWA RIVER,
OF THE DEPOSIT THEREIN OF SAWDUST AND OTHER REFUSE,**

THE

**EXPEDIENCY OR NECESSITY OF PREVENTING SUCH DEPOSIT,
AND THE MEASURES REQUISITE FOR THAT PURPOSE,**

TOGETHER WITH

**EVIDENCE ADDUCED BEFORE THE SAID COMMITTEE,
AND A LIST OF THE WITNESSES EXAMINED.**

PRINTED BY ORDER OF THE SENATE.



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1888.

REPORT.

THE SENATE,

COMMITTEE ROOM NO. 2,

WEDNESDAY, 15th May, 1888.

The Select Committee appointed by order of Your Honorable House, made on Tuesday, the eight day of May instant, "to enquire into and report upon the extent and effect upon the Ottawa River, of the deposit therein of sawdust and other refuse, the expediency or necessity for preventing such deposit, and the measures requisite for that purpose, with power to send for persons and papers," beg leave to make their Third Report, as follows:—

Having in view the late period of the Session at which the Order of Reference was made, and the desirability of making as complete an investigation as possible into the important subjects referred to them, Your Committee proceeded with all despatch to the consideration thereof, and have devoted much time and patient attention thereto.

A large number of witnesses, representing the various interests involved, appeared before Your Committee and were examined by them. Appended is a list giving the names and occupations of the gentlemen so examined, and Your Committee submit herewith the testimony given before them.

Although the scope of the Order of Reference was enlarged by your Honorable House, so as to include in the inquiry an examination into the extent and effect upon the Ottawa River of the deposit therein of refuse of all kinds, other than that merely from the sawmills upon the banks of the river, Your Committee, in their desire to present a report upon the main questions involved, deemed it advisable to forego any special enquiry into the question of deposits of offal, sewage and night soil and the effect thereof upon the public health, which matters, however, will be found incidentally referred to in the evidence of several of the witnesses.

Your Committee have also carefully considered the Report, made in February, 1873, by the Honorable H. H. Killaly and Messrs. B. W. Shephard and John Mather, the Commissioners appointed in 1871 to enquire into the condition of navigable streams, and the Report, made in June, 1877, by Mr. John Mather to the Minister of Marine and Fisheries, on the subject of the disposal of sawdust and mill-offals in the Ottawa River. They have also had the advantage of the professional evidence given by Mr. John K. Arnoldi, Mechanical Engineer of the Department of Public Works, by Mr. H. A. Gray, Assistant Chief Engineer of the same Department, who was charged to make an examination, in the summer of 1887, as to the actual condition of the bed of the Ottawa River and the extent of deposits therein of sawdust and other mill refuse; by Mr. G. T. Brophy, O.E., of the same Department, Superintendent of the Ottawa River; by Mr. F. A. Wise, the Superintending Engineer of the Rideau Canal, and by Mr. T. C. Keefer, C.E., all of whom, from their official position and peculiar experience, were able to afford Your Committee most valuable information.

Your Committee desire to acknowledge the readiness with which information was furnished them by the various mill owners and manufacturers of sawn lumber who appeared before them, and whose interests were ably represented by Counsel, as well as the valuable information afforded by all other witnesses.

Your Committee are of opinion that it is established beyond question that extensive deposits of sawdust and other mill refuse exist in the Ottawa River, from the Chaudière Falls to the head of the Grenville Canal, and that these constitute a very serious and steadily increasing interference with public rights of navigation, which has already become seriously obstructed, and must, at no distant period, if immediate measures are not taken to arrest the evil, become irretrievably destroyed. These

deposits also prevent the utilization of property along the banks of the river for the construction of wharves and for other similar purposes, and likewise cause further damage to riparian proprietors by the depreciation in value of property on the river front.

Your Committee find, from the evidence given before them, that sawdust and other refuse of sawmills can be economically utilized, and that the destruction thereof is successfully accomplished in at least one sawmill upon the Ottawa River, and in many others in Canada and in the United States of America.

Your Committee are also of opinion that these large deposits of decaying vegetable matter constitute at times a dangerous menace, if not a positive injury to health.

Your Committee accordingly recommend that the proclamation, made on the 17th April, 1885, by which that portion of the Ottawa River lying between the Chaudière Falls and McKay's Bay, and also all that part of the Gatineau River from the mill pond above Gilmour and Company's mill at Chelsea to the mouth of the said Gatineau River, are exempted, so far as regards sawdust only, from the operation of the seventh section of the "Act respecting the protection of Navigable Waters" (R.S.C. Chap. 91), be rescinded by the Government as soon as practicable, having regard to the large and important interests involved in a business of such extent and public importance as is the lumber trade, and that thereafter, the provisions of the said section should, in the public interest, be strictly enforced.

All which is respectfully submitted.

WILLIAM MILLER,
Chairman.

List of Witnesses Examined by the Committee

The Honorable A. W. Ogilvie, Senator, Montreal.
do James Dever, Senator, St. John, N.B.
do John Glasier, Senator, Fredericton, N.B.
John K. Arnoldi, Mechanical Engineer, Department of Public Works, Ottawa.
Henry A. Gray, Assistant Chief Engineer, Department of Public Works, Ottawa.
George T. Brophy, Superintendent of the Ottawa River, Department of Public Works, Ottawa.
Robert Surtees, Water Works Engineer for the City of Ottawa, Ottawa.
A. F. Wise, Chief Engineer Rideau Canal, Ottawa.
T. C. Keefer, Civil Engineer, Ottawa.
John Tilton, Deputy Minister of Fisheries, Ottawa.
H. Robillard, M.D., City Health Officer, Ottawa.
William P. Lett, City Clerk, Ottawa.
W. G. Addison, Lock Master, Rideau Canal, Ottawa.
John Stewart, Mining Engineer, Ottawa.
John Heney, Alderman, Ottawa.
John W. McRae, Forwarder, Ottawa.
Alex. Bowie, Captain Ottawa River Navigation Co's SS. "Empress," Ottawa.
A. Ratté, Boatman, Ottawa.
Charles Proper, Millwright, Arnprior, Ont.
T. Besserer, Farmer, Besserer Landing, Hull, P. Q.
A. C. L. Dunning, East Templeton, P. Q.
Sydney Smith, President Ottawa Boating Club, Ottawa.
G. T. Murphy, Lumber Merchant, Ottawa.
John Bryson do do
P. M. Bronson, Lumber Merchant and Mill owner, Ottawa.
E. H. Bronson do do do
John R. Booth do do do
John Mather, Lumber Merchant and Mill owner, Keewatin.
C. R. Cunningham, Insurance Agent, Ottawa.
H. K. Egan do do
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EVIDENCE

TAKEN BEFORE

The Select Committee of the Senate appointed to enquire into and report upon the extent and effect upon the Ottawa River of the deposit therein of sawdust and other refuse, the expediency or necessity for preventing such deposit and the measures requisite for that purpose.

JOHN R. ARNOLDI, Chief Mechanical Engineer of the Department of Public Works, called and examined.

By Honorable Mr. Clemon :

Q. You are mechanical engineer of the Public Works Department? A. Yes, and I am also superintendent of dredging for Ontario and Quebec.

Q. You are well acquainted with the Ottawa River? A. Yes, I have been travelling on the Ottawa on the dredging service since 1879, and before that on my own account as well.

Q. Can you give us your experience with reference to this river from the time you first knew it up to the present time? You were here before the mills were erected? A. No, not before exactly. I have been residing in Ottawa since the year 1866; from the year 1869 I have been living on the Ottawa front, in the proximity of Rear Street, commanding a full view of the river, and since 1873 I have been living on the very brink of the river. When I first knew the river, the portion where the water works now discharges, what was called Cockburn Bay in olden times, it was in its natural state—mud to the water's edge, and a resort for pleasure excursions, row boats, pic-nics and things of that kind. There was no possible obstruction at that time to the free navigation of the river for small boats.

Q. Was that below the falls? A. Yes, below the falls. It is what is called Cockburn Bay. There was no obstruction to small boats in any shape or form, and this clear water navigation extended all the way up Brigham's Creek to the rapids, and the place now called Ratte's boat house was also a great resort for small boats, and I never saw any difficulty in using any of those places for boats to go in and out of.

By Honorable Mr. Botsford :

Q. Please explain where Ratte's boat-house is? A. It is the bay where the "Peerless" wharf is. It is the eastern edge of Major's Hill. From the year 1866 the obstruction there from sawdust and mill refuse has been gradually increasing, until it is now almost impossible to navigate that bay in a small boat, and I am under the firm belief that this obstruction extends almost the whole way down the river, cropping gradually into all the bays. Of late years I have had more to do with deep craft boats, like tugs and dredges. I have the management of all the Government dredges, and we have had sometimes great difficulty in getting over the bars in the river from want of water, especially at the Blanche, opposite Rockcliffe. In the vicinity of Rockcliffe, and down to the mouth of the Lievré, there are very large deposits of mill refuse. I might give you a kind of recital of what I know merely in a casual way, because I have never made any special soundings of the river. I am speaking as a navigator. Do not confound my evidence in any way with a report or examination which has recently been made from a civil engineering point of view. At the foot of what is called Pine Tree Island, as well as I can find

out from enquiry, at the time of the survey by Mr. Walter Shanly, I think it was in 1859, it was reported to me that there was 39 feet of water below that island; and in the year 1866 a shoal of sawdust and mill refuse stood out of the water on that same spot, probably 4 feet.

By the Chairman :

Q. At what season of the year? A. It does not make any matter what season of the year or condition of the river; because you take the maximum depth of water 39 feet.

Q. Was it at high water? A. The information I had in 1859 was that there was 39 feet of water there in high water. I am giving that 39 feet as the best information I could get about it. At the low water in 1866, as near as I could calculate the thing, a shoal of mill refuse was standing out from two to four feet above the low water level and this extended I think fully six or seven hundred feet down stream from the island with a proportionate width. This was a sufficient obstruction to navigation that many boats grounded on it. The least carelessness in following their channel would ground a vessel on that shoal. I was on it myself, Mr. Gilmour's yacht was on it, and other vessels plying on the river have been on it.

Q. Did the island cause accumulation at that point? A. I ascribe this accumulation as being formed by the strong current coming down in high water and washing out the bays in the vicinity. Wherever you have an island or any obstruction in a rapid current it forms an eddy and the refuse settles in the dead water. In the year 1837 at low water, it was very much lower than 1886, I think it was the lowest water we have had for forty years—this shoal had practically disappeared from observation. I did not run over the ground as I was very busy, but I think the greater portion of the shoal had entirely disappeared to a certain limit of depth showing that the mill refuse is not permanent when it forms a shoal—that it will move according to the state of the water and finds other localities to deposit itself in. I am also aware that the bay at the mouth of the Rideau Canal between Major's Hill and Barrack's Hill is so filled with mill debris that it is almost impossible to navigate there at a low water. It is a positive obstruction and the material is of such a nature that it cannot be removed by ordinary dredging plant. Special appliances will have to be constructed to remove that deposit or any other deposit of mill refuse.

Q. You say it cannot be removed by ordinary dredging plant? A. No, you have got to have special arrangements, because a dredging tug has just a big scoop and there is teeth in it for hard packing, and if you put that down into mill refuse and it comes against a slab it is stuffed and sticks on the teeth. Then when you start it again and get the stuff into a bucket you cannot dump it. It will be a scientific problem how to take that stuff out. Another difficulty which will be attendant on the removal of this mill refuse, differing from the ordinary dredging in the channel of a river, is in the dredging of ordinary earth in clay or gravel or such natural deposits, you can dump it into scows or you can throw it on the banks if you are near enough to do it, and that is the end of it. In regard to working it by scows the scows when loaded are towed off to deep water and emptied there, forming no obstruction to navigation; whereas in the case of mill refuse it has all got to be taken ashore somewhere, and an apparatus constructed for burning it, which is going to be a very expensive operation. It will take some time to dry the material to such a condition as will allow it to be burnt. Farther than that, in a river like the Ottawa where you get high freshets there is a great deal of sand and silt, and ground up gravel and one thing and another which gets mixed with the sawdust and which prevents it from being of a very combustible nature. In fact I see no way at all to get the stuff lifted from the bottom or getting rid of it except by this burning process or by carting it into valleys or gulleys. It has to be handled on shore. It cannot be got rid of in the water by dredging. I should estimate the cost of handling, that by the time you are finished with it at ten times the amount of ordinary dredging. A year ago, and also three years ago the navigation of the River Gatineau within a mile of the mouth where it adjoins the Ottawa was so obstructed that barges loading at Gilmour's mills could not be taken either up or down. They could be taken up light, but the

tow boat that had to take them could not go and bring them down loaded from the piling grounds. Consequently, the Department of Public Works had to dredge there on both those occasions to open a passage for the lumber trade.

By Honorable Mr. Botsford:

Q. Were those obstructions caused by the refuse from the mills above here? A. I am coming right to that. In the course of the progress of this dredging I frequently examined the material taken from the bottom, and I find it to be a mixture of ground granite and sand and sawdust, &c., from the mills. I showed it to Mr. Gilmour, one of the applicants for the dredging, as he was the only one interested in this navigation, and he had to acknowledge that there was a good deal of mill stuff in it. These obstructions without any doubt at all, are merely and purely from the mills above on the Gatineau. Of course it must be admitted at the same time that a raging torrent, such as the Gatineau is, for miles and miles brings down boulders with the ice, and they grind against each other and make the most beautiful sand in the world. For building sand it could not be excelled. No doubt a great deal of that is attributable to the spring freshets coming through this very rapid river.

Q. Mixed with sawdust? A. Yes, to a certain extent. In some places we would get pure sand and then in the next yard or so we would get on to a mixture of sand and sawdust.

Q. That came down from Gilmour's mills? A. Certainly.

Q. Do they grind their slabs there? A. I think they put them through the "hog." Any observer going up the Gatineau River just above the railway bridge—a few hundred feet or so, will see a large shoal right in the middle of the river extending probably four or five feet over the level of the water composed entirely of mill refuse. There is a channel on either side and in the middle is this great amount of mill refuse. It includes also stumps and roots and sticks and one thing and another, and keeps enlarging year by year. In all rivers where there is a flow of silt and freshets if you stick a walking stick into the channel the silt will form a shoal in a few days. Near the mouth of the Gatineau there are a large number of piers for tying booms to, and beyond everyone of those piers you will see a large shoal just as I explained just now in the eddy of the current. I have seen ten or twelve feet of water right along on one side of the pier and by going around to the other edge of it you would find a shoal dry out of the water. Of course the great argument with the lumber men is that the main channel of the river is not obstructed by sawdust. I will admit that to a very great extent but that is not the question. That is their way of defending themselves but it does not settle the question at all. You take a river indented with bays along its banks. The great stream runs down the centre. As the water runs it carries with it in a floating state the silt, sand, sawdust and mill refuse. Of course they will not stand in the main channel. They slide off into the bays where the current forms an eddy. In some of those bays you will find 20 or 30 feet of silt and sawdust. Therefore the reason why the channel is getting shallower on the whole route on the river is because the sawdust and mill refuse has taken up the space that nature provides for the silt to settle in. The sand being heavier than the sawdust it remains in the bottom of the channel and the sawdust floats into the bays where it sinks. The main channel is thus obstructed by the natural silt of the river because the sawdust fills the place that nature intended for the silt to be deposited in.

Q. When the bays get all filled up with sawdust what will become of this other stuff? A. It is lodging in the channel now. The bays are nearly filled with mill refuse now. You ask me what will become of the river after the bays are all filled up. I believe that after the bays are all filled up the river will become a sort of road bed for a railway or something of that kind—it will not be navigable.

Q. You have described certain localities: are there any other localities that you are aware have become filled up with the débris from the sawmills on this river? A. I may say that I have described these localities here because they are nearer home, but I believe the same thing prevails all the way down the river to Grenville. In the rapids between Grenville and Carillon there is a great rush of water and the

sawdust is washed through there. But a few years ago, on going through the Lake of Two Mountains between Carillon and St. Ann's, very little sawdust would be seen; now you can see that the bays on that route are filling up with sawdust from Hamilton's Mills to Montebello. This is a point that you have to be sharp on. The lumbermen will tell you plainly that there is nothing in the channel and they are quite right. The mill refuse will not stay there; but the river from the time you leave Ottawa until you reach Grenville is interspersed with islands and the consequence is the water is thrown from one side to the other forming eddies into which the sawdust is gathered and it is filling up all the little bays. There is a very large shoal at the mouth of the Lièvre where it was once deep water and now you cannot run a skiff in. Below Government House here at the city the square timber men used to band up the rafts in the bays; now there is about thirty feet of sawdust there standing out of the water. The bays all the way down are filled in in that way. When you ascend the Lièvre River a few miles, and at Buckingham there are large mills, the refuse from which is thrown into the river. Then when you get down to Petite Nation you find the Edwards mills; and they burn to a certain extent their refuse and are doing very fairly. At North Nation there is a bay there, also a mill, and when you get to Montebello there are mills again on both sides of the river, all contributing their share to the refuse that is filling up the bays. At the mouth of the South Nation we had to dredge last summer on a shoal of this stuff. We have also had to dredge the mouth of the Salmon River, three miles below the Montebello River to let cordwood barges in. I admit that we dredge sand there, but the shoal is the result of the natural bays of the river being taken up by sawdust and slabs. When you get down to l'Original wharf there is about six miles of a run there, and if you do not keep the lights exactly right you will surely go ashore. The shoals in the channels there are pure sand, and there is where the natural freshet silt is coming to, it is coming down the channel and depositing itself in the middle of the river instead of going into its natural receptacle, the bays. You might have that sand shoaled there without a mill on the river however. Another large shoal has formed in front of the Grenville Canal, and you have to hug the north shore very closely through a narrow channel to get into the canal. That shoal is pure sand, but it is formed there to a great extent by not having any chance to be deposited elsewhere, the bays having been filled up with sawdust.

By Honorable Mr. Botsford :

Q. Then, according to that, if there were no mills on the river, the silt would fill up all those bays which are now filled with sawdust? A. Yes, but that would take centuries.

By the Chairman :

Q. And there would be no difficulty in dredging it? A. No, an ordinary dredge such as the Government use will lift off sand or mud such as the Ottawa River is composed of, from 400 to 700 cubic yards per day. Now, if she took out of that sawdust 100 yards a day, I think she would be doing very well. The first cost would be, a tug could only do 20 per cent. of what she could do in ordinary dredging; then the next cost is that it is almost impossible to get rid of this sawdust and mill refuse after you have it dredged. It would have to be thrown into scows, and carted on shore and dried and burned, or filled into gullies, which would cause an enormous amount of handling. Right in the middle of Cockburn's Bay here below the city, the shoal stands right out of the water now. It is right in front of my own house, and I see there is another shoal which has been forming for years on the opposite side of the river, which is also appearing above the water.

Q. You think if no steps were taken to provide a remedy, the evil will go on increasing until the river becomes useless? A. The channel will become so contracted, that it will not be navigable. Of course when you shut the channel of a river up it will begin to scour and find another channel. The channel will frequently change like in the Mississippi, and the shoals will shift from one place to another. The floating refuse as it appears to the eye on the surface of the water, all depends upon the wind as to which direction it will take. It may be all on the north shore

for perhaps a week or a fortnight, and the wind will turn to north or north-west, and it will blow it all to the south side, and a certain proportion of it is carried down the middle of the river to some of the shoals or bays.

Q. Is there any difficulty in getting rid of the sawdust at the mills without throwing it into the river? A. There is no mechanical difficulty at all in providing means for getting rid of sawdust. The fact of the sunken sawdust and mill refuse being a permanent obstruction wherever it is deposited in the river, is well known. The late Horace Merrill, superintendent of the Ottawa River Works in his lifetime, and who had as much experience on the river as most men have had, told me that he had dug up sawdust where it had been down forty years, without the slightest sign of rot in it. From my own personal observation, in dredging at Shannonville, I have seen the dredge take up sawdust from the bar at the mouth of the river, although a saw mill had not been on the river for thirty years. Before retiring from this part of my duty, I want to put in something that perhaps has not struck anybody as being important, and which I consider to be one of the most important facts against the sawdust nuisance that has ever been brought to notice. As I have told you, I live right over the cliff, and from my own window while dressing, I can see the barges and the cribs and the sawdust and refuse coming down. Now, a thing that demands the most serious attention, perhaps more serious than anything else is the danger that is arising from the sawdust deposits. These piles of sawdust in the bottom of the river generate a gas which produce explosions by which the "Peerless" might be broken to atoms. I have seen three explosions a week occur in front of my own house. I have seen a barge thrown clear up on top of the water by an explosion of this kind in front of my house. In proof of the danger of these explosions there is a shipyard on the Hull side, opposite the steamboat wharf, and in the course of my duties I have used that ship-yard for wintering Government vessels. About four or five years ago, during the winter, when the ice was a couple of feet thick, I crossed over to Hull by the regular main road across the ice, say on Thursday, and the very next day, in the middle of the river, the whole of that ice was blown up for about two acres—broken into atoms, right over the very route the steamer comes when coming in with her passengers. These explosions you may have at any moment on the river. Now, to continue the statement about the ice, the broken ice froze together again solid, and within a week or ten days it blew up again in the same place. That is the most extraordinary part of it. One would have thought that the gas had been got rid of by the first explosion, but such was not the case. I apprehend that some very serious accident will arise from these spontaneous explosions. I cannot say how far down the river these explosions occur, but I know that from the proximity of the Queen's Wharf to the discharge from the city waterworks, they may be expected at any moment, at any hour of the day, or any season of the year, but probably most in summer. You can imagine yourselves what a tremendous deposit there must be from those mills. I think that is the most serious aspect of the whole thing. Of course, from the obstruction of the river is a commercial loss, but the danger of life is still more serious. The stench that arises from the river after those explosions is terrible. It comes from the fermentation of this mass of organic matter. Of course, the Ottawa water contains a large amount of vegetable and chemical matter in suspension, and when it is deposited with the sawdust and other refuse, the fermentation of the mass creates this gas. There is another point worthy of consideration. Every steamboat that navigates the river has to take its supply of water for the boiler from below the water line. They put in a pipe with a rose at the end to prevent any foreign material from entering the pipe, but it is with the greatest difficulty they keep their pumps in working order in the vicinity of Ottawa, owing to the sawdust. In navigating the Ottawa myself, I have always to run outside of the floating sawdust to avoid getting the pumps choked. Sometimes in navigating the river it is like going through porridge from 6 inches to a foot thick, according to the pressure of the wind. Sometimes you have got to go through it; you cannot avoid it, because the water is so shallow outside of the channel.

By Honorable Mr. Glasier :

Q. Does not the current shift these shoals from side to side before they get firmly imbedded? A. Yes; especially at high water. I think they are to a great extent migratory with the wind also.

By the Chairman :

Q. What do you think of the practice of grinding up mill slabs and edgings in the hog? A. It is a question that has never yet been practically decided whether it would be better not to use the hog and to put in the slabs and edgings in their full length. They vary, of course, from 2 feet to 12 and 16 feet long, as they come from the saw. In going through the hog they are crushed up into small particles, from half an inch to 6 inches long; and this stuff makes a solid mass when it gets into the sawdust. I think it has a great tendency to pack the shoals harder than they would be if the same stuff were thrown into the river in the shape of slabs and edgings. The argument against the whole slab is that they float with one end out of the water, and that they stick in the bottom and gather silt round them. I am very much of the opinion that putting in the slabs whole would be an advantage, because they would not form such a solid mass in a shoal, or form a shoal so quickly, and in the next place I think all the slabs would be taken out of the river by the poor people before they got far down the river. Taking everything into consideration I think it would be a great advantage not to use the hog in the mills. There is another thing—I do not know whether you are aware of it or not—the mill owners tacitly acknowledge the Act respecting the pollution of rivers without complying with it. About 2 or 3 years ago there was an Order in Council passed to allow them to put sawdust and slabs into the river as far down as the mouth of the Gatineau. Why that Order in Council was made I do not know. I am aware that a couple of years ago there was a law suit entered against the mill owners, by Mr. Ratté, a boathouse keeper, for obstructions by mill refuse in the vicinity of his boathouse, whereby his business was so damaged as to become almost unremunerative. I never heard the result of the case.

The Committee adjourned until to-morrow at 10 a. m.

OTTAWA, Saturday, 12th May, 1888.

HENRY A. GRAY, Assistant Chief Engineer, Public Works, called and examined.

By Honorable Mr. Clemow :

Q. You reside in the city of Ottawa? A. I do.

Q. I believe you were employed last year by the Government to make an examination of the Ottawa River between this city and Grenville? A. Yes, in connection with the sawdust and mill refuse deposits in the Ottawa River between here and Grenville.

Q. Will you please give us the result of your examination? A. In July last, I received instructions to make certain examinations of the bed of the Ottawa River, between the Chaudière Falls and the canal at Grenville, and for me to ascertain, as far as possible, by cross-sections and borings, the effect, if any, upon the navigation of the river caused by the mill refuse and sawdust, which has been, and is, at present time, deposited in the river by different mills.

We commenced our examination at the head of Kettle Island; some three miles below the city of Ottawa, leaving the portion above this point to be examined after the season of navigation, as it was expected that it would take all the time between the first of August and the close of navigation to examine from Kettle Island to Grenville.

The first cross-section AA was taken from nearly opposite Hillman's Mills, three miles below the Rideau Canal. Starting from the Quebec side of the river, crossing the north channel the western end of the island and the main channel to the Ontario shore.

The river at AA is about one mile wide, at high flood, as the water at that stage covers the point of the island. At low water the main channel is half a mile wide; the deepest water being near the Ontario shore. The north channel is only 200 feet wide, and not navigable at low water.

Five borings were made on the line AA—No. 1 on the shore of the island shows six feet of granitic sand (the sand is the same as shown in glass jar marked "boring No. 2"), it was clean and without any woody matter; No. 2 boring, 700 feet south of No. 1, was sunk to a depth of 14 feet and found to contain fine granitic sand mixed with sawdust in small quantities; No. 3, 600 feet from No. 2, and about the centre of the river, shows a coarse granitic sand and small quantities of sawdust with a considerable amount of small mill refuse matter; No. 4 is coarse granitic sand, sawdust and mill refuse; No. 5, near the Ontario shore, opposite to Hillman's Mills, went through 2 feet of mill refuse into clay, as shown in jar.

Cross section BB—Five miles below Rideau Canal extends from the Quebec shore across the north channel, between Kettle Island and the shore, thence over the extreme east end of Kettle Island across to the main channel, continuing southerly over the west end of Goose Island and the south channel to the Ontario shore.

The north channel is now impassable at low water for anything but small row boats. Twenty-five years ago there was 20 feet of water in this channel. It is now filled with sawdust, mill refuse and sand.

Three borings were taken in the main channel on this cross-section; No. 1, near Kettle Island shows 18 feet of granitic sand and limestone sand with considerable quantity of sawdust mixed together with the sand; Nos. 2 and 3, to a depth of 14 and 13 feet respectively, show clean granitic sand. The current of the river at this point is somewhat more rapid than at the head of Kettle Island, and shows, by observation taken when cross-section BB was made, 1 mile in 48½ minutes.

Goose Island, at the west end (see plan), has a very large accretion composed of granitic sand and mill refuse, which is gradually, but surely, encroaching upon the main and south channels.

A boring was taken to the east of Kettle Island, near the Government boom, and shows three feet of sawdust on the top of limestone sand. At this place there is a constant escape of gas coming up through the water generated from the decomposed sawdust at the bottom of the river.

The shores of Kettle Island and the mainland on the Quebec side are washing away.

A photograph taken from the east end of Kettle Island (see plan) shows the Government boom and the shore covered with mill refuse. This refuse is often set fire to in the summer season and has been known to reach inland and destroy valuable crops.

Cross-section CC 7½ miles below the Rideau Canal, and a little above the lighthouse at Templeton, extends across the main channel from the Quebec side to the east end of Goose Island; thence across the water, dividing Goose Island from Duck Island, across the latter and the south channel to the Ontario shore.

Three borings were taken on this line. The shore on both sides of the river and the under bed is composed of limestone rock *in situ*. Boring No. 1 shows three feet of sawdust and mill refuse with very little sand mixed lying on top of the rock; No. 2, two feet of the same on top of the rock; No. 3 is near the west point of Duck Island, and was taken to find out what material is filling the south channel and causing the accretion to the island; the result proved it to be decomposed sawdust.

Cross-section DD is 10½ miles below the Rideau Canal and about half a mile below the mouth of the Petite Blanche River.

This portion of the River Ottawa is one of difficult navigation, being so shallow at low water. A channel was opened some years ago in the middle of the river, but it is not used; vessels take the channel near the Quebec shore.

The river is about ¾ of a mile wide, at low water, at this place. The current is slow, being only 1 mile in 1 hour and 40 minutes, when observed on the 25th August, last.

The Quebec shore is covered with chips, mill refuse and sawdust.

Boring No. 1, near the Quebec shore, shows 4 ft. 3 in. of clay to hard pan; No. 2, 900 feet from shore shows 14 ft. 3 in. of mixed sand and with it considerable sawdust, which probably extends much deeper; No. 3, 600 feet from No. 2, shows granitic sand with small quantity of woody material; No. 4, 700 feet from No. 3, 6½ ft. of granitic sand; No. 5 is near the west end of one of the Leonard Islands and shows sand and large quantity of sawdust and other mill refuse.

There was originally a good deep channel between the Ontario shore and the Leonard Islands, so Mr. Besserer informed me, and he has lived near this place and observed the river for the past twenty years; but it is now filled in 6 to 20 feet deep with slabs, sawdust and other mill refuse and the islands are covered with the same kind of materials.

Mr. Besserer has dug down through 10 feet of sawdust on the islands to get to sand for building purposes. He is opinion that it is the slabs and sawdust which collect and retain the sand. He complains that the foul gases arising from the decomposed sawdust is sometimes in summer, at low water, quite unbearable. He has seen the mill refuse coming down the river so compact that it was four and five feet in thickness and would bear the weight of a person.

Examination was made of the Petite Blanche River. It is about 90 feet wide, at its mouth, and has high clay banks. At low water it is dry two miles from the mouth. In spring the current is very strong and to this fact is attributed the formation of the bar in the Ottawa River.

Cross-section EE is 16 miles below the Rideau Canal, and immediately below the mouth of the Lièvre River. The Ottawa at this point is narrow, being only some quarter of a mile wide. The water is deep—over 40 feet near the Quebec shore. The natural banks are composed of clay. No borings were taken into the bottom of the river as it was found, from the soundings, to be of the same material as the banks.

On the east side of the Lièvre River an immense bank of sawdust has collected within the past 20 years, and it is from 25 to 30 feet in depth at the water's edge. It is in layers, very compact and intermixed with other mill refuse. (See photograph of this bank and specimen taken from bank.)

The Lièvre River was examined as far as McLaren's and Ross' mills, a distance of some 5½ miles from its mouth.

The Lièvre is full of mill refuse and large shoals of it are on each side of the river and in some places form islands in mid-channel, with only narrow passages of water on each side.

The lumber from the above mills is carried in sluice-ways a distance of four miles from the mills to the "loading ground." Barges are partially loaded at the ground, then floated to the mouth of the river to finish loading from rafts, the river being choked with mill refuse.

The mills on the Lièvre River cut from 25,000,000 to 30,000,000 feet of lumber every year and deposit all their refuse in the river.

Between the mills and the loading grounds there are some sand banks 50 to 150 feet high. They show great erosion. Sable Lake (Sand Lake) a distance of 60 miles up the river, there are sand banks 300 to 400 feet high. Constant erosion is taking place and thousands of yards are annually carried down by the freshets in spring and deposited in the Ottawa River with the sawdust and refuse mill material.

Three miles below section EE the McCaul Islands commence, near the Ontario shore. Originally there was a channel 12 feet deep between these islands and the Ontario shore; now it is filled with sawdust and sand. These islands extend a distance down the river of 2 miles.

Cross-section FF is 21 miles below the Rideau Canal, opposite Rockland.

The river at this place is only 1,100 feet wide, but very deep in the centre; there being over 67 feet at lowest water.

Boring No. 1, near the Quebec shore, shows 9 feet of limestone sand and mixed with a large quantity of mill refuse. The channel bottom is mud. No. 2, near the Ontario shore, shows 4 feet of mixed sand and mud with mill refuse.

The current is slower at this point, being only 1 mile in 2 hours and 40 minutes on 1st September last.

The large mills belong to Mr. Edwards, M.P., and situated at Rockland, cut 2,500 logs per day during the season. These mills do not deposit any sawdust or mill refuse in the river, it is all consumed in a furnace built for this purpose. The sawdust being used for fuel. The furnace cost, so I was informed, \$10,000. I think this is much in excess of the price of such a structure, as they are used on the Georgian Bay, and cost less than \$4,000 there. Formerly, before the furnace was erected at Rockland, it required thirty men and horses to remove the refuse and deposit it, now one man and a boy do all the work attending the furnace.

The deposit of sawdust and mill refuse from the mills higher up the Ottawa River has nearly filled in the large bay or pond, used for booming the logs for this mill. The place requires to be dredged.

Cross-section G G is 26½ miles below the Rideau Canal, opposite Thurso, on the Quebec shore. This cross-section is taken a little below the Blanche River, and runs across the head of Clarence Island, near the Ontario shore. The channel at this place has nearly a uniform depth. The shore on the Quebec side is covered with mill refuse, and for a distance of over 100 feet out into the river there is a heavy deposit of sawdust mixed with clay and sand as shown by borings taken 14 feet in depth. The bottom of the river in the centre is composed of sand, and on the south side clay and boulders are found.

The bottom of the channel, between Clarence Island and the Ontario shore, is covered entirely with sawdust, and is filling in very rapidly. The shore of the island is also covered with mill refuse.

An examination was made of the Blanche River. There are large deposits of mill refuse at the mouth on each side. I am informed there are no mills cutting lumber on this river.

Thirty miles below the Rideau Canal are the Parker Islands, these consist of a group of islands five in number and reach some two miles in length to a point opposite Wendover, Ontario. An examination was made of the main channel near these islands, and it was found that the bottom is covered with sand. The water is quite shallow—only 11 feet at lowest water and that only for a narrow width. The shores in some places covered with sand and sawdust.

Cross-section HH is 24 miles below the Rideau Canal. This section extends from the east bank of the mouth of the North Nation River, to the east bank of the South Nation River. The Ottawa at this point is about half a mile wide.

Boring No. 1, taken about 50 feet from the Quebec shore shows 16 feet of limestone sand, clay and decomposed sawdust. No. 2, 400 feet from the shore, shows 9 feet of the same materials with a less amount of sawdust. From the soundings it would appear that this material extends beyond the bottom of the river for some 1,300 feet from the shore. Boring No. 3 is 350 feet out from the Ontario shore and went down 6 feet 9 inches through clay and mill refuse, principally sawdust decomposed; No. 4 near the shore, 4 feet 6 inches in depth, shows the same materials as No. 3.

The shores of the Ottawa and the mouth of the North and South Nation Rivers are covered with mill refuse and sawdust.

On the South Nation River, one mile from its mouth, is the sawmill owned by Mr. F. X. Wilson. This mill cuts from one and a-half to two millions feet of lumber every year. It has been in operation three years. All the refuse is burned. Mr. Hagar's mill, two miles from the mouth cuts one and a-half to two millions feet annually. This mill has been in operation four years and burns all refuse stuff.

There are other small mills further up stream towards the crossing of the Canada Atlantic Railway, 30 miles from the mouth; these mills cut only for the local trade.

There were mills on the North Nation River and they deposited all their refuse into the stream, when in operation.

The current of the river at HH was very slow, being only one mile in four hours and sixteen minutes, when observed on the 10th September last.

Between the Nation Rivers and the entrance to Papineauville Bay—a distance of 7 miles—there are a number of private landings; at all these there is a large deposit of mill refuse and sawdust on the east side.

An examination was made of the entrance to Papineauville Bay, 41 miles below the Rideau Canal. There is a large shoal of sawdust at the entrance; a boring showed 10 feet of this material; the water on each side of the shoal is deep.

Cross-section II is 44 miles below Rideau Canal, half a mile below the village of Montebello on the Quebec shore. The Ottawa at this point is only 1,500 feet wide but very deep, having over 70 feet at lowest water in the channel and steep banks on each side. Borings were taken on each side of the river and showed that the banks are composed of a large deposit of limestone sand, and sawdust.

The Salmon River is about half a mile below cross-section II, and runs in on the Quebec side; at the mouth is a large accumulation of sawdust and mill refuse.

Cross-section KK is 51 miles below the Rideau Canal and near McTavish's Lighthouse. The river is very deep here and in the channel there is over 80 feet at low water. The banks are covered with sand and mill refuse gradually encroaching upon the channel:

Two borings were taken on the Quebec side—13 and 10 feet deep respectively—they show mill refuse, sawdust and clay bottom. The Ontario side shows sand and mill refuse.

Cross-section LL is 57 miles below Rideau Canal and immediately below the Calumet River.

The Ottawa River is both deep and wide from KK to LL.

A boring 10 feet deep was obtained on the Quebec side on LL and shows sawdust and sand.

There is a large shoal about a mile below section LL and immediately in front of the entrance to the Grenville Canal. The examination made shows it to be composed of sand and small traces of sawdust.

The examination recorded in the above pages extended from the Rideau Canal to Grenville a distance of 60 miles. It is also 60 miles from Montreal to Grenville.

By Honorable Mr. Botsford:

Q. What is the appearance of the decomposed sawdust? One would suppose that it would float. A. It will not float, it sinks.

By Honorable Mr. Clemon:

Q. It never rots? A. No.

By Honorable Mr. Scott:

Q. I suppose after fermentation takes place it undergoes a chemical change? A. Yes. Take that and put it into a glass of water and it will sink at once. (Showing the contents of a jar.

Q. All the lighter substances have been consumed in the process of fermentation? A. Yes.

By Honorable Mr. Clemon:

Q. Can you state how you found the Bay L'Original? A. On the shores there is an accumulation of sawdust, but not any very large quantity. The river is very wide there, and it does not seem to reach so far.

On the 28th September the work of examining the river between Kettle Island and Grenville was completed and the tug "Ada" came from Ottawa and commenced to tow the survey boat "Nemo" to the Rideau Canal basin, where it arrived on the first October; having been delayed by fog and smoke. The crew and navigating captain were then paid off.

It was found necessary to make a complete survey of the Ottawa River from the Chaudière Falls to the mouth of the Gatineau River, a distance of $2\frac{1}{2}$ miles, in order to obtain definite information relative to the deposit of sawdust and mill refuse immediately below the large mills at the Chaudière, which is the head of navigation. A large portion of the river, included in the above survey, had been examined by

officers of this Department in the years 1857, 1859 and 1884. The soundings shown upon the plans of these examinations have enabled me to make a set of cross-sections and to show upon them a comparison of the depths found in 1857 and at present date.

It will be observed that on line AB (sheet No. 2) very little sawdust and mill refuse is shown and that only in the formation of an island near the Hull shore. The bottom of the river here is rock and the channel narrow, consequently the current is swift and prevents deposits. The island formed of sawdust and mill refuse, mentioned above, is in a back eddy.

Line CDE below the island in mid-channel shows a very large deposit of sawdust and mill refuse since 1857. At the point D, as much as 40 feet in depth.

Line DG is from point D a small island, in the river, immediately behind the House of Parliament, to Stirling's wharf a little to the south of Nepean Point, and at the entrance to the Rideau Canal. This line shows a very large accumulation of mill refuse, and from it through the "entrance bay" to the locks the deposit is very great, and at low water giving trouble and delay to vessels passing in and out of the canal.

By Honorable Mr. Botsford :

Q. What is the difference between the depth at that cross-section and the depth at the cross-section of 1857? A. There is about 30 feet.

Q. Do you mean to say that there is 30 feet of a difference in the depth of the river there? A. Yes, near the entrance. There is not so much in the channel where the bottom is rock.

From C and for a distance below Nepean Point the bottom of the river is entirely covered with mill refuse. Further on to the mouth of the Gatineau River the bays are filled and the channel is gradually, but most surely, being encroached upon with the same material.

A quarter of a mile from Nepean Point, following down the shore to the mouth of the Rideau River, the sawdust is filling in and encroaching on the channel on both sides of the river. Line HI begins about $\frac{1}{4}$ mile above the mouth of the Gatineau River and crosses the river to the Gatineau Ferry. HK begins near the same point on the Quebec side, about $\frac{1}{4}$ mile above the Gatineau River, and extends to McKay's Bay just below Rideau Hall grounds. That bay is filled with sawdust.

Q. What is the difference in depth between the cross-section of 1857 and the cross-section taken last summer? A. The difference must be about 40 feet there.

Lines HI and HK below the Rideau River and line ML a little above the Gatineau River show the above.

It has been a very difficult matter to obtain reliable information from any outside sources with respect to the amount of damages consequent upon the dumping in of the sawdust and mill refuse into the Ottawa River. When asking information I have found reluctance on the part of the mill owners to give answers which might be used against their interests. Mill owners who do not place their sawdust and mill refuse in the river did not wish to have their names mentioned as giving information against those who do. Merchants, shippers, traders and others, living in and near Ottawa, are so dependent upon the mill owners and lumbermen that they declined to give information, except in a few cases.

It will thus be seen that what with the above and the fact that in the Public Works Department we have no record of any former examination or survey that would give me data for comparison, it is impossible for me to state the extent of damage done to the river from the sawdust and refuse.

That millions of sawdust and mill refuse fill the bays and creeks and cover the shores of the Ottawa River, gradually encroaching upon the channel, and in many places obstructing navigation, cannot be denied.

Some idea of the quantity of sawdust deposit in the river may be formed from the following official return of last year's business of the Chaudière mills :

	Feet, B.M.
Bronson & Weston.....	65,000,000
J. R. Booth.....	70,000,000
E. B. Eddy & Co.....	69,000,000
Perley & Pattee.....	70,000,000
Hurdman & Co.....	56,000,000
Grier & Co.....	35,000,000
Total.....	<u>365,000,000</u>

This return is said to be some 15 per cent. under the amount of previous years. It is estimated that at least one-eighth of the amount of material cut is sawdust. Now, taking the above figures, we find 365,000,000 feet B.M. equals 4,380,000,000 cubic inches, equal to 2,534,722 cubic feet or 93,878, cubic yards; allowing that more is cut from the log than returned as feet, B.M., and also that the above return is 15 per cent. under the amount of former years, then at least 100,000 cubic yards is the output, and one-eighth of this means 12,500 cubic yards of sawdust alone deposited into the Ottawa River every year from the Chaudière mills from the process of cutting up the logs.

The above is only sawdust. To this must be added slabs and edgings. Much of the slab wood is broken up by "hogging" machines and this increases its damaging effect upon navigation, this operation causing it to be the sooner water-logged and consequently to sink. If the stuff was allowed to go into the river as slabs it would be picked up for firewood; now it is useless and sinks to the bottom, forming with the other material a mattress, which, in course of time, cannot be broken up or lifted by dredging. This difficulty was, I am informed, met with at the mouth of the Gatineau River.

There are lath and other machines dumping the sawdust from year to year into the river.

It is no uncommon occurrence for explosions to take place in the gas generated from the sawdust. In January last an explosion took place opposite the Rideau River and broke up the ice, bringing from the bed of the river a large amount of mill refuse. Another explosion took place on the night of the 11th April, and ice 14 inches thick covering an area of 1,500 feet was thrown up and broken into small pieces.

To remove the sawdust and mill refuse from the river, or a portion of same, by dredging, is a most difficult problem to solve. Where it is loose a dredge bucket cannot pick it up, and where it has become matted together it would have to be cut or separated by explosives before being dredged. But even if it were easy to be taken out of the river where could it be deposited?

By Honorable Mr. Scott :

Q. Have you had any experience as to the effect of sawdust in other localities?
A. No.

Q. I understood that you had made some examination at Spanish River? A. I received some information when I was making inquiries respecting the river here. I was in Collingwood some little time ago and a gentleman there told me that at Spanish River, Byng Inlet and Serpent River, where they have large mills they found it almost impossible to work them. The men after going there took typhoid fever and the doctors in the vicinity say that it is attributable to the gases arising from the decomposed sawdust. If you take a stake and push it down through three or four feet of water just below Kettle Island, and pull it up quickly you will see the gas bubbling up, and the smell arising from where we took the boring was something unbearable at times.

By Honorable Mr. Clemow :

Q. Have any of these samples been analysed? A. No.

By the Chairman :

Q. What is your opinion as to having them analysed? A. I think it would be advisable to take some fresh sawdust from the bottom and have it analysed.

By Honorable Mr. Scott :

Q. Would not the gases escape on the exposure of the sawdust to the earth?

A. I do not think you could measure the quantity, but you could ascertain whether they were poisonous or not.

Q. Could not the gases be collected by putting down a hollow cylinder with a vacuum above, and in that way collect the gases? A. Yes; that could be done.

By Honorable Mr. Botsford :

Q. Are you aware of any method of destroying the sawdust? A. No.

Q. Do you know of any 'mechanical means by which it could be utilized or burnt? A. It is burnt at other mills. At Mr. Edward's mills and on the South Nation River it is burnt, and I have seen all the mill refuse burnt at the mills at Midland, Waubanshene, Penetanguishene and other places.

By Honorable Mr. Olenow :

Q. At Edwards' mills they consume all the sawdust? A. Yes, and at the mills on the South Nation River.

Q. Do you think that the hogging machine is a detriment rather than advantage? A. I do, most decidedly.

Q. Some years ago it was considered an advantage? A. It is no advantage. The wood being broken up, of course it becomes water logged quicker and sinks to the bottom where it becomes a perfect mattress.

Q. I suppose in course of time, when these bays are all filled up, the refuse most naturally goes into the channel? A. There is no other place for it to go.

Q. Ultimately the whole channel must be filled up? A. In a few years' time there would be no navigation of the river.

Q. I understand that the water was very low last year? A. Yes, very low—four feet ten inches above the sill at the lower lock of the Rideau Canal.

Q. You had an opportunity of judging of the character of that sawdust and you say that the smell emanating from it was so obnoxious that you could hardly stand it? A. It was very obnoxious.

Q. And injurious to health? A. Yes, I know the effect it had on myself.

By Honorable Mr. Scott :

Q. You can speak of it from your personal experience? A. Yes. When our boring tools would come up, the sickening smell would be so great that at times I had to go to the stern of the vessel.

Q. Then you became actively ill? A. Yes.

Q. Had it the same effect on others? A. Some of the men on board suffered the same way.

Q. You were not here a great many years ago before the saw mills were established? A. No.

Q. So you do not know anything about the destruction of the fish? A. No.

By Honorable Mr. Haythorne :

Q. Can you say whether the sand bars that are formed are to be attributed entirely to the accumulation of refuse from the mills? Perhaps the cutting down of the woods has some considerable effect on that? A. I think that has effect on the erosion of the banks above this city, and some comes down the Gatineau and the Rideau rivers. There are banks on the Livree River 150 to 200 feet high of sand alone, and they show a great deal of erosion. They tell me that higher up the river there are very high banks of sand, and of course when they erode it is carried down the river.

By Honorable Mr. Scott :

Q. The water comes down in a shorter time when the woods are cleared away?

A. The thaw is more rapid and the floods are greater and quicker in their operation.

GEORGE P. BROPHY called and examined.

By Honorable Mr. Olenow :—

Q. You are a resident of Ottawa? A. Yes.

Q. I believe you are employed in the Department of Public Works? A. Yes.

By the Chairman:

Q. In what capacity? A. Superintendent of the Ottawa River Works.

Q. Give us a connected statement of what you know of this subject? A. I do not know that I could add anything to what Mr. Gray has stated. He has made a survey of the river.

By Honorable Mr. Clemon:

Q. How long has he been employed in the Department? A. Since 1873.

Q. Before the mills were erected? A. No, since then.

Q. You know nothing as to the river prior to the erection of the mills? A. No.

Q. You have examined the river from time to time, I believe? A. Yes, I have been up and down the river pretty often.

Q. Have you observed the effect of the sawdust? A. I think the sawdust and mill refuse are constantly accumulating and encroaching on the river channel. I have never made any survey as Mr. Gray has done, but I know from my own observation that the mill refuse has accumulated at certain points.

Q. Will you speak as to these points? A. For instance, in these bays that Mr. Gray speaks of—McKay's Bay, and Black Bay further down, and all on that side of the river, I know the sawdust is accumulating constantly, and it is accumulating in the Gatineau around the Government booms. In 1874 we had to put dredges on to dredge out a channel. We found a very large quantity of sawdust and this stuff from the hogging machines and slabs, all interlaced and very difficult to move. So much so that in many places we have to turn the dredge around and just force the stuff up to the side and let it remain there.

Q. At the entrance to the locks, you understand about the accumulation there? A. Yes.

Q. Have you any information to give about the depth of the water? A. No, I never took the soundings: I only know from observation and what I have been told by others. Mr. Wise has taken soundings there and can give you information. I know particularly about the Gatineau and around our own works there, the stuff coming from Gilmour's mills is constantly accumulating, and the Government have had to put on dredges at three different times to clear the channel,—in 1874, in 1882-3 and I think the year before last and last year, there were dredges employed there for that purpose.

Q. You are in charge of those works? A. The Government works, not the dredges—Mr. Arnoldi has charge of them.

Q. Did you ever make representations to the Government about the accumulations of sawdust? A. No.

By Honorable Mr. Botsford:

Q. From your observation there is a great deal of accumulation of sawdust and refuse lessening the depth of the water in those places that you mention? A. Yes; at one particular point I had charge of the dredging one year—I think it was in 1876—across Green Shoals, and we found the sawdust and slabs all interlaced there with the layers of sand as we did the dredging—that was about 4 or 5 feet down—and the pilots at that time and the boatmen all said that the sawdust and slabs were accumulating gradually and closing up the channels. There was undoubted proof of it there at that particular place, because we had to dredge it out.

Q. What place is that? A. Below Kettle Island—Way's Shoals.

By Honorable Mr. Clemon:

Q. Is the channel shallow at that point? A. No; but it had filled up. The pilots on the boats at that time claimed that it had filled up there and they could not use it, and they crossed to the north channel, but they preferred the other, and we dredged it out.

Q. They could not use that channel? A. They could not use it until it was dredged out.

Q. Is there anything else that you wish to say? A. I think as Mr. Gray does that the hogging machines do more harm than good. I think that if the stuff has to be thrown into the stream it would be better to throw in the slabs.

Q. When was the hogging machine introduced? A. About 1870.

Q. It was considered a improvement then? A. Yes, but I think it was a mistake.

By Honorable Mr. Haythorne:

Q. Have you noticed those offensive gases that Mr. Gray spoke of? A. Yes, I have often noticed that when boating, and when we were dredging it was unendurable. The refuse will often come up almost dry and moulding.

Q. You know that there was a great deal of sickness here last fall? A. Yes.

Q. Do you know that it was attributed to the gases coming from the decomposed sawdust? A. There have been a great many theories about that.

By Honorable Mr. Botsford.

Q. In boating on the river have you observed this gas rising? A. Yes, I have seen the explosions, as they call them.

Q. And when not boating you have observed the odor of the gas? A. Yes, when dredging.

By the Chairman.

Q. If you were near one of those explosions, such as you have seen, would you be in danger? A. I have never seen but one that would upset a small boat; that was at the foot of that island, but the smell is unbearable.

Q. Mr. Arnold said yesterday that he had seen explosions that would destroy the "Peerless" if one of them had occurred when she was passing over it? A. I have no doubt of it.

COMMITTEE ROOM,

Monday, 14th May, 1888.

ROBERT SURTEES, C. E., of the city of Ottawa, called and examined.

By Honorable Mr. Clemon:

Q. You are city engineer of this city? A. I am water works engineer at present. I have been city engineer for the past twelve years.

Q. How long have you lived in this part of the country? A. About twenty-eight years in New Edinburgh and Ottawa.

Q. Will you be kind enough to give the committee any information you have respecting this sawdust matter commencing at the time you first knew the river and following it up? A. There are only certain parts of the river I am acquainted with. There is the second bay below New Edinburgh that I know most about. I made a survey of that river front for the Mackay estate twenty-eight years ago, and I remember that bay distinctly, that there were the ordinary water plants and growth along the bay—it was in its natural state and with a good depth of water in it. I do not know what the depth of the deposit of sawdust there is now, but I know that the bay is filled up to the line between two points, and there is a very large accumulation. There is an eddy which works up towards the Rideau Falls above that and I know that that is being rapidly filling up also. I know that opposite the mills in New Edinburgh boats used to come in there at all stages of the water without difficulty, and I now believe at low water it is very difficult for them to come in at all.

Q. You have seen the deposit of sawdust at the foot of the locks? A. Yes, I remember a few years ago that boats could not get in there on account of the sawdust and it had to be dredged out.

Q. Does that trouble prevail at the present time? A. Yes, all the time, especially with prevailing west winds when the sawdust is blown in there in immense quantities.

Q. Has it had any effect on the water? A. As you are aware we have had difficulty in connection with the recent epidemic of typhoid fever and we have had analyses made the water and the analysts all agree that it came from pollution of the water by organic matter, bark, sawdust and sewage. Apart from that the water is pure.

Q. You give this as your opinion as manager of the waterworks? A. Yes.

Q. Twenty-eight years ago was there good fishing in the river? A. Yes, splendid fish.

By Honorable Mr. Botsford :

Q. What kind of fish? A. Pickerel principally.

Q. How is it now? A. It is about five years ago since I fished below the Rideau Falls and I did not get any then. I used often to get a dozen in the evening in the first bay when I lived below New Edinburgh.

Q. What size do the pickerel grow here? A. I have got them three pounds in weight, but they are generally from 6 to 9 inches in length. You very seldom get them large. I have seen maskinonge caught below the falls some years ago, and pike.

By Honorable Mr. Clemow :

Q. You know all about the mills up at the Chaudière? A. Yes.

Q. Have you any idea of the quantity of lumber they cut each year? A. I could not say from memory. I have seen returns, and it can be easily found out.

Q. Do you know that the large portion of the refuse from the mills goes into the Ottawa River? A. Yes; I know it does.

Q. Do you know how they grind up their slabs and refuse? A. Yes, with a hog.

By the Chairman :

Q. Do you know the river from the Ottawa down to the mouth of the Gatineau? A. Yes; I see that the island opposite Bank Street has been extended down the river some hundreds of feet by sawdust, and the channel between the island and the Quebec side is all blocked up compared with what it used to be.

By Honorable Mr. Clemow :

Q. Have you noticed the large amount of sawdust and refuse opposite the mill which used to be owned by Batson & Carrier? A. Yes, that is the channel I speak of. It is all filled up. That is the island opposite Bank Street.

Q. From a sanitary point of view, what is your opinion of the effect of this sawdust being thrown in the river? A. I do not think it can be good. I think it would be a scientific question for analysts. I knew the smell of it is bad. We have not got it quite as bad above as it is below.

By Honorable Mr. Macdonald (B.C.) :

Q. There is no sewage above the falls? A. There is no city sewage discharged above the falls.

Q. I suppose there is from Aylmer and the small towns above? A. Yes, but there is a large lake and several rapids between there and the Chaudière which purifies the water.

Q. Is there anything done to prevent night soil and refuse from being thrown into the river here? A. No.

Q. You have seen it placed on the ice on the river in the winter season? A. Yes; I think some was placed there with the sanction of the Board of Health. They generally take that under their charge. They do it without consulting the City Council.

By Honorable Mr. Haythorne :

Q. Can you give us any idea as to the best means of getting rid of these accumulations and preventing further obstructions of the same kind? A. There would be no difficulty in burning the refuse.

By the Chairman :

Q. But as to the present deposits? A. That is another matter. It is quite a problem what to do with it. It is not dry enough to burn. You cannot take it up the same as sand; it would require special appliances to dredge it. I saw the difficulty they had in dealing with it at the foot of the locks. They had to get a special arrangement to pull it out into the current and let it float away. Of course that would go to some other place further down the river. They tried to take up the stuff but they could not dredge it.

Q. I presume it could be done? A. Yes, it could be done, but it would cost a good deal of money.

By Honorable Mr. Haythorne :

Q. Are you aware of any means which could be adopted to prevent further depositing of sawdust and mill refuse in the river? A. It could be burnt as it comes from the saws in the mills.

Q. Without incurring vast expense? A. Yes, without incurring a very large expense. I know three mills down the river which make steam with the sawdust.

By Honorable Mr. Clemon :

Q. Gilmour's mills, Batson & Curriers and others consumed the sawdust in that way? A. Yes, they never bought any other fuel; they made the steam from the refuse.

By Honorable Mr. Haythorne :

Q. But in the case of water mills they would not do so? A. They would require a special appliance to burn the sawdust and refuse. They would require a furnace like the one down at Rockland.

By Honorable Mr. Clemon :

Q. Is there anything else that you wish to state to the Committee? A. I noticed an explosion which occurred during the winter on the ice road from the Queen's wharf over to the Quebec side. It occurred during the night and blew up 50 or 60 square feet of the ice right on the road. If there had been any teams there lives would have been lost.

By Honorable Mr. Botsford :

Q. You did not see it yourself? A. No, it occurred during the night, but I saw the place in the morning and the ice was all broken and sawdust was scattered all round on ice.

By Honorable Mr. Macdonald (B.C.) :

Q. The explosion was the result of accumulation of gas? A. Yes, I have often seen the gas escaping down opposite new Edinburgh, in that part of the river.

WILLIAM P. LETT called and examined :—

By Honorable Mr. Clemon :

Q. You reside in Ottawa? A. Yes.

Q. What position do you hold? A. I am the City Clerk.

Q. How long have you resided here? A. Almost continuously since I was ten years of age. I was three or four years out of the city during that time.

Q. You were here before the construction of these mills at the Chaudière? A. Yes; I was here when there was only one single upright saw.

Q. And you have been on the river a good deal during that time? A. Yes.

Q. Will you give us your experience of the river before the construction of the saw mills and since? A. The navigation was never obstructed in any particular before the construction of the mills. Out here where this big bed of sawdust is now, after you got a little bit from the island, there was 30 to 40 feet of water all the way down. I know that positively, having fished there, from the length of rope I used to have for an anchor. At the foot of the locks, as soon as the deposits of mill refuse unite with the bed of sawdust in the eddy, the navigation of the canal will be completely blocked. That will be within five years, I think at the outside. I may say at the commencement that I have read Mr. John Arnold's evidence very carefully, and Mr. Gray's evidence, both of whom have had good opportunities of knowing all about it, and I corroborate all that they have stated to the Committee. They have touched nearly every point that I could touch myself.

By the Chairman :

Q. You can state your general knowledge of the river before the mills were erected and what you know of it now at different points? A. The sawdust is filling up all the bays and eddies and little channels between the islands all down the river, and it very much obstructs the usefulness of the river. The consequence is that in very high water the low lands on the north side of the river between here and

Grenville are overflowed some two or three feet every year more than it used to be before the obstruction of the river—the meadow lands and lands of that kind. I did not notice until last summer that a large island was formed in the river just on the other side. I went up there in a canoe one day last spring and discovered this island that I had never seen before. I went over to it and found that it was formed of blocks, edgings, sawdust and other mill refuse. It seems to me that that island before five years will close in right up against the dock on the far side, and they cannot take a barge there at all. I have not the slightest doubt in the world that unless some remedy is discovered, and that very soon, no steamboat in low water—no tug boat or boat the size of the “Peerless,” ten years from now, will be able to go to Grenville at all. It is a difficult matter now in low water.

By Honorable Mr. Clemon :

Q. You used to fish in the river in your early days? A. Yes, it was one of the best rivers for fish that I know of. Every eddy was full of fish. The fish is a matter of some importance, though it is of little consideration now.

By Honorable Mr. Macdonald (B.C.)

Q. Were there any salmon in the river? A. No, but there were pickerel, pike, black bass and a great many maskinongé.

Q. Are there any fish in the river above here? A. Yes, up at the Des Chenes Lake, at the Britannia Rapids, a great many fish are caught still. I live on the bank of the river near New Edinburgh, and there is a little eddy between the corner where Sir John Macdonald's house is and the dock of McLaren's mills: I never had to go further than that to catch fish. I could catch any number that I wanted during the lawful season; now you might fish there for a week and perhaps would not catch two.

By Honorable Mr. Botsford :

Q. Is the black bass a fresh water fish? A. Yes, there were very fine black bass in the river. Over at the north side of the river, where the tall chimney stands, you could catch as many black bass as you wish before the fish were fished out, and while the river was clear. The bottom of the river is covered with sawdust, and the pickerel, which is a ground fish, and was the principal fish in the river could not remain. It has disappeared. It must have sand, earth or gravel.

By Honorable Mr. Clemon :

Q. The people had sufficient in those days to supply them? A. It was a matter of very great importance to the people. I suppose there were sixty or seventy thousand people living between here and the confluence of the Ottawa with the St. Lawrence—there are fifty thousand adults at any rate, besides the children and the fish they caught and benefited by would be worth \$2 for each adult for the year over and above what it is now, when the river was in good condition.

Q. That is a loss of \$100,000 a year alone? A. Yes, although it is the smallest consideration in this matter. The maskinongé is the best fish in the river, or in any river, except the salmon.

By Honorable Mr. Botsford :

Q. What size does the maskinongé attain? A. Thirty, forty and fifty pounds in weight. I saw one sixty pounds in weight. I have caught them twenty-five pounds myself.

Q. Are they the same as the maskilonge that are caught in the lakes? A. The same as are caught in the Thousand Islands, in Lake Simcoe and all those lakes. It is an immense fish and the very best fish. About the gas explosions I have noticed them more particularly when the water gets a little lower than usual. I go out in the canoe every day I can get out after 6 o'clock and spend the time until dark on the river. The gas explosions occur in every part of the river between the Chandière Falls and Gatineau Point and below that. I have seen the sawdust rise and the river rise too. The highest one I ever saw was 3 feet, out in the open river, and the sawdust would spread all out for a circle for at least 100 to 200 feet, and the water would seem as if it were mixed up with mill refuse.

By the Chairman :

Q. Would there be any danger to your boat? A. If you were crossing in a small canoe when one of the largest explosions took place, it might possibly upset; with

any kind of a good boat it would not. I remember the explosion under the ice which Mr. Surtees referred to. I saw the fragments of the ice lying over the surface of the river next morning. Mr. Henderson told me that there was one of the same kind last year opposite McLaren's mills. The extent of it I do not know. The bay spoken of by Mr. Surtees, called McKay's Bay—at least we call it the Second Bay—is filling with sawdust. I suppose there must be at least 20 or 30 feet of sawdust deposited there now. It was one of the most beautiful eddies on the river before it was filled with sawdust.

By Honorable Mr. Botsford:

Q. I suppose there is refuse of other kinds as well? A. Yes, mill refuse of all kinds—slabs, sawdust, blocks, &c. Another consideration—I suppose the least of all—is the right that every man has to the free and unobstructed use of that river, even in small boats. The small boat has a right, a minor right of course, as well as the big steamer, and every man that lives on the bank of the Ottawa, ought to have free and unobstructed use of that water as it ought to be, without being obstructed by refuse of any kind. I say so with great unwillingness because, I am disinclined to say a single word adverse to the great enterprise at this city, but I am here to state what I know about the subject.

Q. You say that the refuse from the mills interferes with the small boat navigation? A. It is an intolerable nuisance to the small boats as it is to the large boats, such as propellers. The sawdust gets in and does immense damage. It greatly interferes with the right of people to go out in small boats in the months of July, August and September, when the water is low and the current less than it is now; you get stuck then in the refuse. It would take half an hour to get from the shore to the middle of the river owing to the obstruction caused by the mill refuse.

By Honorable Mr. Olemow:

Q. Have you seen those explosions that have been talked of. A. Yes, I have seen six or seven of them in the same evening. They very often occur when the "Peerless" comes in. When the waves roll in we see the bursts of gas all over.

By Honorable Mr. Haythorne:

Q. Do you detect unpleasant gases when passing over the water in your boat—is there a smell from the water? A. There is when a very large one comes up. You can smell not exactly an odor of turpentine, but a disagreeable smell; more particularly in the banks of sawdust if you stir them up here and there—you get a very obnoxious smell.

Q. The water was very low there last year? A. Very low.

Q. Did you observe the effect of the sawdust during the time of low water—Did you observe any obnoxious odors from it? A. I was not very much down where the sawdust was. I was only once down the river, any distance, and I did not visit the banks until late in the fall when the water got cold, but I know that when the sawdust is stirred up where it is in deep mounds near the islands, it has a very bad smell.

By Honorable Mr. Haythorne:

Q. Should this refuse be thrown into the river all? A. No; the nuisance is almost intolerable. Everyone who has got to use a large boat or a small boat of any kind on the river finds it a nuisance.

By the Chairman:

Q. You consider it an interference with a great public right—the free and unobstructed navigation of the river? A. I do. It is the chief river of the fifth class, and it stands at the head. Certainly there is no more beautiful river on the continent of America of the same size. The eddies particularly, are very beautiful, where very much pleasure was taken by those who had small boats. You cannot get into them with a boat in low water; it is only in high water that you can use them. What we call the Hospital Eddy—that is the name it is known by on account of the cholera hospital being located there in 1832—is completely obstructed with sawdust. The sawdust and refuse from the mills on the Gatineau do not come up here, of course, but they are equally destructive to the river with the materials thrown into

the river from the mills here. The channel where they run the saw logs out from Leamy's Lake is almost filled up with mill refuse, and they have to use horses and carts every summer to clean it out. They employ this means and take out hundreds of loads every summer where the channel has been filled up.

Q. Do you know anything about Edward's mills? A. No; I do not know anything about them. They are steam mills. The late Mr. Lyman Perkins one day made a calculation in my office of the amount of mill refuse cast into the river in one year—that is 15 years ago, and there are a great many more saws going now than there were then—and he clearly demonstrated that one-sixth of every log went into the river, and at that time there was a bulk of 850,000 solid logs thrown into the river every year in sawdust, slabs and edgings.

Q. From the mills at the Chaudière? A. Yes; from the mills at the Chaudière.

FREDERICK WISE called and examined.

By Honorable Mr. Clemon :

Q. You are the engineer in charge of the Rideau Canal? A. I am.

Q. Will you give us any information you possess respecting this question? A. The information I can chiefly give is what happens to the navigation at the entrance to the locks. I have been on the canal since 1872. In 1881 the accumulation got so bad that they had to stop navigation, and we had to spend \$2,000 there in clearing out the entrance. We did it by a specially constructed machine. We dragged it forward by means of a machine like a big scraper between two barges. There was a windlass to lift it up when it got filled, and we drew it out to where there was about 40 feet of water.

By Honorable Mr. Botsford :

Q. You put in the water again? A. Yes.

Q. To do harm elsewhere? A. Yes. Last year we should have had to do the same thing, the entrance was so blocked up, but it was too late to do anything. Next year we will have to do the work if the water is at the same pitch as it was last year. In addition to that we had to dredge a channel 100 yards wide at the foot of the lock, but the refuse at the bottom came in from all sides.

By Honorable Mr. Macdonald (B. C.) :

Q. Fell into the cut? A. Yes, fell into the cut. We had that place all clear then in 1881; now it is all filled up again.

By Honorable Mr. Clemon :

Q. How was the canal in 1872 when you took charge of it? A. I cannot tell—there was no complaints of it then. We did not pay any attention to it until the navigation was threatened with stoppage.

Q. And the obstruction to navigation is attributable to the mill refuse altogether? A. Yes, altogether. It is so situated that a north-west wind blows it all into that bay, and it has no chance to get out.

Q. Have not the people who are interested in navigation remonstrated from time to time? A. Yes.

Q. And you undertook that dredging? A. Yes, but from 1881 to 1888 it has all filled up again, just the same as it was then.

Q. Can you give us any other information? A. No, nothing further.

By the Chairman :

Q. Do you know anything about the nuisance in any other parts of the river? A. No, except from going down on the steamers.

By Honorable Mr. Botsford :

Q. What was the material composed of that you took up, or carried out into the river? A. The top part was mostly sawdust, and then below it was slabs very closely compacted indeed. It was very hard to get the scoop to take it up. It seemed as you got down to get harder and harder. We found then about 40 feet of water outside of that. The current sweeps around there and of course it would take the sawdust away to other places.

Q. Do you know what the depth of water at the foot of the locks was when you first took charge of the canal? A. No; we did not take soundings until 1881.

By Honorable Mr. Macdonald :

Q. Was there not a quantity of other material thrown into the river besides the mill refuse—ashes, bricks, &c.? A. Yes, there was ashes.

Q. I saw some tons of ashes on the ice near the entrance of the canal? A. Yes; my attention was called to it and I stopped it. I do not know where it came from

ASA L. DUNNING called and examined.

By Honorable Mr. Clemon :

Q. Where do you live? A. At East Templeton.

Q. How long have you resided there? A. I resided there 51 years.

Q. Where are you employed now? A. I am employed here at Ottawa, on the Gatineau.

Q. With whom? A. W. C. Edwards & Co.

Q. You were here before the mills were erected at the Chaudière? A. I have been back and forwards here for over 40 years.

Q. Give us your opinion about the river as it was then and as it has been since? A. In those days, of course, there was no sawdust to be seen. The shores were perfectly clean, the bays were all clean, and there was any depth of water where now they are all full of sawdust.

Q. I suppose there was abundance of fish in the river then? A. Yes, there were lots of fish, but, of course, there was not as large an amount of fish consumed then as now, but there was any quantity of them.

Q. Are there any fish now in the river? A. Not so many now; they are a good deal scarcer.

Q. You have some knowledge respecting the operation of Mr. Edward's mills at Rockland. How do they dispose of their refuse? A. At the present time they burn all their refuse.

By the Chairman :

Q. Could you give us any particulars respecting special places in the river where those obstructions are most noticeable? A. What obstructs our operations most in running logs, is the refuse at Wright's slide and at the foot of the island here. For the last six years in the summer I have been here and the sawdust is a good deal higher now than it was six years ago—much higher.

Q. Where do you work? A. On the river.

Q. You ought to have a personal acquaintance with nearly all the points of obstruction on that portion of the river on which you worked? A. I just got up the Quio and up the Gatineau as far as the Pêche, but the principal obstruction we meet is at the foot of the slide. Of course it becomes a nuisance when it gets mixed with our logs: it takes six more men than we would otherwise have. We do not want to tow it to the mills because it would sink and become an obstruction to us there.

By Honorable Mr. Clemon :

Q. How many logs do they cut in a year at Rockland? A. I could not exactly say, but sometimes we take 100,000 from here, and sometimes 150,000.

Q. How do they dispose of their sawdust? A. They burn it.

Q. Do they put any in the river? A. They did in former times to fill up a big bay there to make a piling ground. As soon as that was filled up they burnt the refuse.

Q. Do you burn it all? A. Yes, at one mill, at the other we are utilizing it to make a piling ground.

Q. But you throw none in the river? A. No.

Q. So there is no reason why it should be thrown out? A. No.

By the Chairman :

Q. Do you utilize it to make steam? A. Yes, but then there is a big surplus over.

By Honorable Mr. Macdonald :

Q. You have a steam saw mill there? A. Yes. I think the furnace that they erected there cost them some \$8,000.

By Honorable Mr. Clemow :

Q. The expense of burning it, is less than it used to be, when the refuse was hauled away with teams? A. It costs less because it used to take about 14 horses carting it away : now it is carried away by machinery.

Q. So it is really an advantage to burn it. A. Yes, for Mr. Edwards' anyway.

By the Chairman :

Q. How many men and horses are employed there? A. I could not say.

By Honorable Mr. Clemow :

Q. What proportion of the sawdust do you consume in the boilers? A. There are eleven boilers, I think : I could not tell you what proportion.

Q. What would be the surplus after supplying yourselves with the necessary fuel—what would remain? A. I could not tell you, but there is a continual run into the furnace.

Q. And if you did not burn it it would have to go into the river? A. It would have to go into the river or be carted away.

By Honorable Mr. Botsford :

Q. I suppose the machinery to carry that way is not very expensive? A. I think it costs somewhere about \$8,000 to erect the furnace. Then there is a slide two or three feet wide, and it is taken away with scrapers going up the slide all the time. I know it is cheaper for Mr. Edwards to burn it than to draw it away, because it took so many horses to do it.

Q. What is the diameter of the furnace and the size of the chimney? A. I could not exactly say, but I think it is 30 feet at the bottom, I did not measure it, but I should think it would be about that.

By Honorable Mr. Haythorne :

Q. Have you greater capacity than for the amount of sawdust you consume? A. I think it would burn more. The sawdust goes in about 20 feet from the bottom and they tell me that the sawdust never strikes the bottom, but is burnt as it goes down. I have never been there when it was running, but that is what they tell me about it.

By Honorable Mr. Clemow :

Q. You have been at the Chaudière mills when they were in operation? A. Yes.

Q. You have seen how the sawdust escapes? A. Yes, it falls straight from the saw into the river.

Q. Is the same thing true as to all the mills at the Chaudière? A. Yes.

Q. Could not the system which is in operation at Edward's mills be adapted to the mills at the Chaudière? A. I do not know why it could not be.

Q. That would get rid of the difficulty? A. Yes, a slide could be made to take it out no doubt.

Q. Do you know anything respecting the effect of the decomposing sawdust and mill refuse on the health of the community? A. You would need to have a medical man to answer that.

ANTOINE RATTÉ called and examined.

By Honorable Mr. Clemow :

Q. Do you live in the city? A. I do.

Q. How long have you lived here? A. I have been over 47 years in Ottawa.

Q. You were here before any mills were erected at the Chaudière? A. The only mill that was in Ottawa when I came here was a small mill run by Burwash.

Q. What year was that built? A. I could not say exactly. It was built before I came here.

Q. You have been on the river continuously since you came here to live? A. Yes, I have been on the river every year.

Q. What was the condition of the river when you first knew it? A. I have been a boat-keeper here for 38 years. Some of my boats would get scattered away from me and I would have to take a boat and hunt them up. I always found lots of water. I could go ashore any place at all. For the last six or seven years I have to portage the boat at a good many places and sometimes turn back and go round another way. All the bays are closed from Rockland up all the way to the Little Blanche. There is an eddy on the north side and from above Rockland until you get to that bay, between Laroque Island, I used to pass up between the island and the shore with a sail boat. You could not get a bark canoe through that channel now in low water. I tried to get through it with a boat drawing two and a half or three inches of water and could not get through. I had to turn back. That island is two and a half or three miles long and extends from Horseshoe Bay to Rockland. The next island is called Capt. Petrie's Island. I used to sail on the south side of that, between the island and the shore, but that is filled up too.

By Honorable Mr. Botsford :

Q. What is it filled with? A. With the material out by the hog and sawdust. In the old times when the mills first started they used to tow slabs into the river and sometimes three-inch plank. If there was anything wrong at one end of them they would throw away the whole length. A good many of them floated into those channels and are there now. Then the material from the hogs filled in on top of that. Petrie's Island is about two and a half miles long, and in summer in low water you can now walk across the channel where I used to sail up with little boats. The next big Island is Kettle Island. Capt. Williams used to be captain of the "Shannon" and "Porcupine" and he used to run his steamers in the channel on the north side of Kettle Island. It was a good channel then. Now at low water we cannot pass through that channel with a bark canoe. A log will not float through it; the logs stop there. The sawdust forms a crust on top of the water. Sometimes the wind blows in one direction for some days, and when the wind blows steadily from the north-west for eight or nine days it fills my bay with sawdust and mill refuse so that you cannot get to the shore with a small boat. Captain Cook used to be captain of the "Maggie Bell," and one time he tried to start a boom of logs with a big tug boat to tow a boom down the river from Hospital Bay, where I live, but he could not start it, owing to the refuse on top of the water. He had to leave it there.

By the Chairman :

Q. How long ago is it since that happened? A. That was six or seven years ago. I saw him from my door. Sometimes I am obliged to anchor a boat out in the middle of the stream and have a rope from my boathouse to that boat to draw the boats out through the mill refuse. They could not be rowed out at all. I have to pull them out that way for about an acre or an acre and a-half from my boathouse. I have seen yachts try to land there but they could not get to the shore because of the accumulations of sawdust.

Q. Did you know the bay when it was deeper? Was it deep before the sawdust floated there? A. About 250 yards from my boathouse there used to be 150 feet of water in low water. Mr. O'Neil and I went and inspected that place about five years ago and found only 14 feet of water. Some years the Ottawa rises about ten feet higher than other years, and when that occurs it shifts this mill refuse to other places. Sometimes it goes down the river. Between the Little Blanche and the Big Blanche, a distance of a mile, at one time there was no obstruction; now there is a bed of sawdust and sand, the current sometimes shifts that from one place to another.

Q. What depth of water is there in your bay now? A. In my bay there is a strong eddy, and the sawdust is carried into the middle of the bay. It forms a mound in the bottom of the river about 250 yards from the "Peerless" wharf. The water is deep enough where the current is strong. At the foot of the locks there was nothing but gravel in the bed of the river when the locks were built, but the sawdust has been deposited there by the eddy and the accumulation is growing all the time, the same way as at my bay. Take the Little Island above the ferry. Some four years ago a measurement was taken there and they found that it was so high with sawdust

that it was exposed in low water, and would dry so that the wind would blow the dust from it. They found it hard and solid enough to build on it. Last year the water was very low, yet there was hardly any of that accumulation there, the current had moved it to some other place. Last summer the water was two feet four inches lower than it had ever been known before, yet I could not see any sawdust at that place. The year before the water was between three and four feet higher yet the sawdust bank for three or four feet above the surface, so it must have been moved to some other place by the current. I suppose a man ought to have a right to the use of the river with a little boat just as much as if he had a big boat, but I cannot find room for my boats owing to the quantities of sawdust and material from the hogs that are carried into the bay where my boathouse is. I am quite sure that there is three times as much stuff from the hog as from the saws. If they must throw that stuff into the river it would be better to throw in the slabs and edgings whole, so the people could pick them up along the shores and use them for firewood.

By Honorable Mr. Botsford :

Q. In your opinion the refuse made by the hog does more injury than the slabs would? A. Yes, because sawdust is very fine and will move freely in the current, but the pieces that come from the hog are often a foot and a-half long. That packs together, but the sawdust would not if it were alone. It packs with the material from the hog so hard that after a time you could build on it. With the sawdust alone you would go through the crust into the water, but when it is mixed with the stuff from the hog you can almost walk on it. The hog does three times as much damage as the saw.

Q. What was the state of the river when you first came here? A. There was only Burwash's mill then.

By Honorable Mr. Clemow :

Q. What was the river like at that time? A. There was nothing but bush on the banks then. The river was clean. You could go along by the shore anywhere. There was nothing but clean banks and you could go into any bay or the mouth of every little creek, but if any man can find a creek that he could go into now I am willing to pay him something.

Q. Were there any fish then? A. Yes. I knew a fellow that used to fish near the bridge and he would catch a barrel in an hour and a half. It was a great river for catfish at that time and bass too, but especially catfish.

Q. Were there pike and pickerel? A. Yes, plenty of pickerel.

Q. And maskinonge? A. Yes, I remember a fellow catching a maskinonge that weighed 37 pounds. They were caught larger than that.

By Honorable Mr. Botsford :

Q. Was there a large quantity of fish caught then? A. A fellow could in ten or fifteen minutes catch as much as he could carry. Opposite my place was a good bay for fish, but now I can fish from morning till night and catch none. •

Q. Have any accidents occurred at your place through people walking over the sawdust and thinking it the land? A. Yes. I remember once a gentleman who had taken out a boat came in with it with a lot of black stuff in it. I thought it was sand. There had been a burst of sawdust and enough was thrown up out of the water to fill his boat. My boathouse is hemmed in with sawdust as tight as can be and strangers who are not acquainted with the river step on the sawdust thinking it is a part of the boathouse.

By the Chairman :

Q. Have any fatal accidents occurred there? A. Yes.

Q. When? A. Eight or nine years ago. A gentleman and two ladies came to the boathouse one time and the two ladies disappeared. We could not tell where they had gone, and we found that they had stepped on the sawdust and got drowned.

By Honorable Mr. Botsford :

Q. Have many lives been lost in consequence of explosion? A. I do not know of any, but people have lost their lives by stepping on the sawdust, thinking it was the land.

By Mr. Christie :

Q. Have you got an action pending now against some of the mill owners of the city of Ottawa? A. Yes.

Q. And is this information which you have been given now the same as you gave before the Court? A. Yes. I suppose I gave some more and some less.

Q. Have you had any experience on the river, other than at the boathouse there, as a pilot, as to the depth of water along the river? A. Yes, for forty-seven years. I have been on the river all the time for 47 years.

Q. You are quite familiar with the currents and the eddies? Q. Yes, I was at that time. Of course I know a great deal because I am hunting for row boats in the bays.

Q. The débris that floats down the river has interfered very much with your private business in the boats? A. Yes, it comes to a crust on top of the water before it sinks.

Q. That is the principal way that it interferes with you in hiring boats? A. Yes, the crust, except if I go to a bay.

Q. How far is your boathouse from the landing of the "Peerless" steamer? A. I suppose 80 feet.

Q. The steamboat comes in there every day during the summer? A. Yes.

Q. And the steamers that navigate the Ottawa river ply up and down there as heretofore? A. Yes.

Q. So that the main channel of the river I suppose, has not been interfered with so far as you know? A. No, not much of the main channel, but the bays are. As I kept boats for hire they sometimes used to be stolen from me, and I used to go to the little creeks and bays where they would hide my boats to hunt them up.

Q. So that the way in which you found this matter interfered with you I suppose has been practically as owner of a boathouse on the shore of the river? A. Yes, the mill refuse has been filling in my bay.

Q. You do not know anything about the main channel? A. No, I used to know, but have nothing to do with it now.

JOHN HENRY called and examined—

By Honorable Mr. Olemow :

Q. You are an alderman in this city? A. Yes.

Q. How long have you resided in Ottawa? A. Since 1844.

Q. You have known the Ottawa River for all that time? A. Yes.

Q. Are you engaged in the forwarding business? A. Yes, we have sent boats the last fifteen or twenty years up and down the river, chiefly for cordwood along the river.

By the Chairman :

Q. Please state to the Committee what you knew about the river forty years ago, its condition at that time and any illustrations that you know of that would show more clearly the condition of things at that time as compared with the state of the river at present? A. The river was navigable mostly in every part forty years ago, and at that time we had a fair share of water, and as for fishing and the like of that it was all right. We had nothing to interrupt navigation at the time. At that time there were not many mills, only one or two small mills at the Chaudière. The creeks were all clear, and you could sail where you liked through them and through the coves all round the river here. In any kind of fair water you could go where you liked, and now that is not so.

Q. Could you state any particular points of the river that are injured? A. The part that I have noticed more particularly, because my business leads me to remark it, is at the foot of the locks. At low water it is almost impossible to go in there unless you run the risk of breaking your tow lines. It has been three or four times dredged out to my memory.

By Honorable Mr. Olemow :

Q. I believe you had a dredge working there? A. Yes. That year the water was low and we could not get into the locks, and the Government employed the

dredge for a certain number of days to clear the channel out. We cleared it out in a sort of a way for the time and left it so that boats could pass in and out, but it filled in immediately again.

Q. What was the nature of the stuff you removed from it? A. Pretty much sawdust and slabs and rough stuff.

Q. Mill refuse? A. Yes, there was bark and sawdust, slabs and edgings.

By Honorable Mr. Botsford:

Q. What depth of water was there when you first knew it? A. There must have been 15 or 20 feet of water at the foot of the locks when I first knew it. I never measured it but from the bottom of the locks there must have been a good depth of water at the approach.

By the Chairman:

Q. No more than 15 or 20 feet? A. I cannot say I measured it, but there was no interruption to navigation going in. I never had occasion to measure it.

Q. Did you raise the refuse when you dredged it? A. Yes, we took it out altogether and brought it out to a point where the current took it away. Since that there was a new plan got up to drag it out to the channel where the current would take it. We took it out of that altogether into the strong current where it was washed away.

By Honorable Mr. Clemow:

Q. Do you know anything about the fishing in that river in years gone by? A. Yes, there was lots of fish in it when I first came here.

Q. Are there any now? A. I do not think there are many.

By Honorable Mr. Smith:

Q. Of all the refuse that you say settles there, which is the worst? A. I think the sawdust is the worst.

By the Chairman:

Q. Have you paid any attention to the gradual accumulation of sawdust and refuse the last few years? A. Yes, and everybody that has seen it has remarked it.

By Honorable Mr. Smith:

Q. What do you think is the cause of the fish going away? A. I cannot say what is the cause of the fish going, but they say they clear away according as the creeks that they used to go into are filled with sawdust. I do not know myself, but I have heard men of experience say so.

By Honorable Mr. Clemow:

Q. You have seen this large amount of sawdust on the other side of the river? A. Yes.

Q. And you have seen the explosions that occurred there? A. No, I did not see them, but I have heard of them often.

By Honorable Mr. Haythorne:

Q. Do you know any instance of those explosions occurring in your earlier days? A. No.

Q. Only since this sawdust has collected there? A. Yes, that is all.

By Honorable Mr. Smith:

Q. Are you aware of them throwing other kinds of refuse into the river besides sawdust? A. I do not know, but I believe there has been a great deal of rubbish thrown in. I have seen them draw rubbish and stuff on the ice in winter.

By Honorable Mr. Clemow:

Q. Has the city authorized that? A. The city never stopped it, for they had no other place. They never stopped it until last year. I do not know whether it is done now or not. I know they have got the night soil taken outside of the city. Every year there is a good deal of rubbish deposited in this place from the city. I saw last year lots of rubbish opposite the steamboat landing on the ice.

Q. In your opinion this obstruction of navigation is owing to the sawdust and mill refuse? A. It has contributed a great deal towards it, I am sure of that.

By Honorable Mr. Haythorne:

Q. You said you did not know exactly what the depth of water was at the locks in the early days? A. No.

Q. But still you had amply sufficient for your purpose? A. Yes, I heard no complaints about it. Mr. Hutchinson knows every inch of water that has been there for the last twenty years, but I never had any occasion to measure it.

By Honorable Mr. Smith :

Q. What do you suppose will be the effect on this river if this practice of throwing in mill refuse is allowed to continue? A. We will have no navigation at all in any parts of the river.

By Honorable Mr. Glasier :

Q. That is in low water? A. Yes.

By Mr. Clemow :

Q. Do you think it has an injurious effect as far as the health of the city is concerned. A. I cannot say as to that.

Q. You know that we had a good deal of sickness in this city last fall? A. Yes.

By Honorable Mr. Christie :

Q. When you refer to the difficulty at the time of the dredging at the foot of the locks was the water not very low? A. Yes.

Q. Was the water not lower last year than it has been known at any time during the past forty years? A. It was very low last year.

Q. What is the depth of the water at the foot of the locks? A. This last few years my boats coming in there cannot load to 5 feet—they used to be stuck in this rubbish coming in loaded at 5 feet.

Q. Do they stick at any other point coming up the river? A. No, not until they come to the foot of the locks.

Q. Is there not a large forwarding trade in lumber from the saw mills of the Chaudière on that river? A. Yes.

Q. Have you ever known of the main channel of the river being impeded in any way by deposits of this material, or is it only in the bays or shoals? A. I saw Captain Bowie's boat stuck in the main channel coming up.

Q. When was that? A. That was a few years ago.

Q. I suppose she is the largest boat that plies on that river? A. She does not draw the most water, I do not think she draws as much water as our forwarding boats do.

Q. Was it not in sand that she stuck? A. Sand and sawdust,

Q. That was on a bar? A. It was a bar in the middle of the river below the island.

Q. Have you ever heard of any place on the river that required dredging except at the mouth of the canal? A. Yes, we were called upon to go and dredge in this same bar in the channel and we found sawdust and sand in the channel about the centre of the river at Kettle Island, that vessels could hardly pass over, that is near the centre of the river, in the mid-channel. The island stands in high water, pretty near the middle of the river, but in low water it is more to the north of the channel.

Q. Was it not between the Quebec shore and the island the steamer was stuck?

A. No, she does not go in the Quebec channel at all; she keeps the Upper Canada side and when she approached the upper end of the island she stuck on the bar there that runs out from the island and we were called upon to dredge it and we found both sawdust and sand mixed in that part.

Q. Is it your experience that after the high water these deposits disappeared somewhat? I never remarked whether it was the case or not.

Q. Did you ever take any soundings of any part of the river? A. Never in my life because we worked away until the stoppage of navigation the best way we could and I never took any soundings.

DR. ADOLPHE ROBILLARD, called and examined.

By Honorable Mr. Clemow :

Q. Are you the health officer of the city? A. Yes.

Q. How long have you resided in Ottawa? A. I have lived here all my life.

By the Chairman:

Q. How many years have you lived here? A. I have lived here fifty years.

Q. Will you please tell us what you know about the condition of the river as it was when you first knew it, as compared with what it is to-day. Was it a free, open and unobstructed stream? A. It was a free, unobstructed stream, where game and fish used to abound.

Q. Was there any accumulation of sawdust at that time? A. No, not that I know of.

Q. Have you been through the bays and creeks frequently? A. Yes, some little distance from the Ottawa River.

Q. I mean along the Ottawa River? A. Yes, about the city. They were free from sawdust at that time.

Q. And free from mill refuse and stuff of that kind? A. Yes.

Q. Do you know the condition of it now? A. Yes, to a certain extent.

Q. As far as you know what is its condition now? A. It is obstructed by sawdust and refuse from the mills all along the coves and creeks. Pretty much all along the river for a distance down it is much the same way.

Q. Are there any noticeable points that you can speak of? A. Yes, for instance on this side of the Ottawa below the city the channel between the north side and the second or third island below the city is choked up altogether.

By Honorable Mr. Clemons:

Q. Do you know anything of the practice of depositing night soil on the river during the winter months? A. I know that there was deposited on the ice certain amount of matter.

Q. We were told here by one witness that it was done under the authority of the Board of Health? A. There never was any deposit of night soil on the river authorized or permitted by the Board of Health. Whatever may be put in the way of yard cleanings, or ashes, I do not know.

By Honorable Mr. Macdonald (B.C.):

Q. Has there been any attempt made to stop that practice of depositing refuse and night soil on the ice during the winter? A. I am not aware that there was any such quantity as is spoken of.

Q. Every winter that I have been here for the last 16 years, there have been tons of it deposited on the ice every year. Have you not seen it? A. I do not think there has been ever any large quantity.

Q. Has there ever been any attempt made by the city Board of Health to stop that practice? A. No.

By Honorable Mr. Scott:

Q. Do the people of the City of Hull deposit any night soil on the ice? A. I do not know that they do. I may have seen some, but I do not remember. I have not seen any this last winter at all.

Q. Is the purity of the water affected by the depositing of rubbish of various kinds on the river? A. I do not think it is affected by it, because there is very little deposited of anything of that kind above the water supply. I presume it would affect the purity of the water below to a certain extent.

By Honorable Mr. Clemons:

Q. Do you know as health officer that there was a great deal of sickness in the this city last year? A. I do.

Q. Do you attribute that in any degree to the sawdust and rubbish in the river? A. No, I do not think it.

Q. The water was very low last summer? A. Yes.

Q. Do you think there was any miasma arising from the sawdust deposits? A. I do not think there was anything that would affect the health of the citizens of Ottawa, whatever effect it might have on some of the low locations down on the bays bordering on the Ottawa where people dwelt.

Q. Do you think it would have an effect on those localities? A. It might, inasmuch as the obstruction to a free circulation of the water by this matter, which would gather animal as well as vegetable matter with it would be a hotbed for all kinds of organisms, and in that way might become a source of danger.

Q. Did you ever analyze this stuff found in those beds or shoals? A. No.

Q. It could be analyzed? A. Yes, it could be analyzed by a specialist.

Q. There was a theory that the water supply was affected by mill refuse? A. No, I do not think so—not from that cause.

Q. Could there have been any miasma from the opening of the main sewer into the river? A. I do not think there would be a sufficiency of room to generate more gases in the sewer than would escape through the openings above.

Q. Have they got a sanitary inspector for the city? A. Yes.

Q. Is that all you know about the river? A. I am quite aware of the fact that the river is much obstructed, and that these obstructions by sawdust are a great injury to navigation, and may be an injury to the health of parties living on the lower part of the river. There is no doubt that it is the principal cause for the disappearance of the fish from the Ottawa River.

By Mr. Christie :

Q. Is it not a general cause of complaint that there is a large quantity of night soil and rubbish from the city of Hull deposited on the ice during the winter? A. It is not deposited in sufficient quantities of itself to injure the water.

Q. But it is spoken of as a general dumping ground? A. I do not think so.

By Honorable Mr. Scott :

Q. There is a population there of 10,000 people: where do they deposit their dirt? A. I do not know where they put it, but they certainly do not deposit it on the ice of the Ottawa.

By Mr. Christie :

Q. Has it not been a general complaint that the ice has been used for that purpose from both sides of the river, strongly against the wishes of the boards of health? A. Such deposits are made to a limited extent, I do not think to a sufficient extent to be productive of any serious evil.

Q. Does not the sewage of the city of Ottawa fall into the Ottawa River below the city? A. Yes.

Q. Would it not be the natural consequence of the flood coming down in the spring and raising the water of the Ottawa to deposit sand and other material on the shallow places along the banks? A. It would in the bays of course where they are not obstructed.

Q. And if the banks were being gradually cut away on one side of the river, the natural effect would be to fill up the shallows on the other side? A. Yes.

Q. As far as your information with regard to the navigable channel of the Ottawa is concerned it is from hearsay you speak: you are not accustomed to boating? A. What I know of it is from what I have seen while travelling on the river on the boats for several years past.

Q. From your experience as a physician of the city for a long period, has not the general health of the city been very good? A. Yes; very good. It will compare favorably with any other city in Canada.

Q. And the water supply of the city is taken from above the mills—above the Chaudière Falls? A. Yes.

JOHN W. McRAE, of the City of Ottawa, called and examined.

By Honorable Mr. Clemons :

Q. How long have you resided in the city? A. Since 1870.

Q. What is your business? A. I am a forwarder.

Q. Can you give us any information respecting the condition of the River Ottawa in 1870 as compared with what it is at the present time? A. The bays were

not as full of sawdust in 1870 as they are now. The bay at the foot of the locks was fully as bad that year as it was last season. That is the reason it was dredged out by Mr. Heney.

Q. The mills were all erected then? A. Yes. The season of 1870 and last year were two seasons of the lowest water that we ever had. Of course we felt it more in the City of Ottawa last year than before because of the improvements that were made down at Ste. Anne's. In former years we could load our barges only to 3ft. 6in.; but last year we loaded about 5ft. in consequence of the improvements at Ste. Anne's. Consequently we felt more the damage from the low water round here than we did before. The whole difficulty was round Ottawa and down to the mouth of the Blanche. The Green shoals is the lowest place in the main channel. I do not think there is any sawdust there at all. There may be some sawdust in the channel down at Hillman's mills; and round the docks here, where there used to be about 25 or 30 feet of water in 1870, there were less than 5ft. last summer.

By Honorable Mr Glazier :

Q. Then the river must have filled up with sawdust? A. Yes, round the docks and bays here, but I do not think you will find much in the main channel. A year ago last summer we had a long sawdust reef from the foot of Pine Island down to the foot of the locks. The ice the next spring took the greater portion of that away; so that where there was dry sawdust the year before, you could go over that last summer with five feet of water. Then on the north side of Pine Island in 1872 or 1873, Messrs. Batson & Currier built a large pier there. The pier upset, and the slabs and sawdust coming down with the current accumulated there and formed quite a shoal, which every year has been getting greater. My experience is that shoals in places like that, at the head as well as at the foot of Pine Island, freeze down solid for some distance in the winter, and in the spring the top is moved off with the ice to other places.

By Honorable Mr. Clemon :

Q. Do you know that the river has had to be dredged at the foot of the locks, and in several other places? A. Yes, and it has been pumped out by steamers. There had been more difficulty at the foot of the locks from sawdust than in any other part of the river.

Q. What is that obstruction caused by? A. There is a large eddy there, and the wind blows the sawdust in, and it settles at the entrance to the locks.

Q. Then you think it has been gradually getting worse from 1870 up to the present time? A. Yes.

Q. If it continues in the same ratio, what do you think will be the effect on navigation? A. I do not know what the ultimate result will be; I do not think it can settle very much more around here except at the foot of the locks, but in the bays below which are not full yet, it will fill in there. It certainly will not stay in the middle of the river, because the ice and the current in the spring of the year will take it away.

Q. When these bays and coves are filled up it certainly must find a place somewhere? A. Yes.

Q. What do you think of the practice of grinding up the slabs in the hogs? A. It is a question in my mind whether it would be better to hog the refuse or to saw it up into short pieces and throw it into the river.

Q. Or keep it out altogether? A. To keep it out altogether is certainly the best. The hogged stuff sinks, but the slabs would be picked up, to a large extent, to be used by poor people as firewood.

Q. I suppose you know nothing as to the effect of this mill refuse being thrown into the river on the health of the city? A. I know nothing about that.

By Mr. Christie :

Q. Have you had any experience of working out the sawdust from about the docks where your boats go in? A. Yes.

Q. Do you find any difficulty in removing it? A. By putting in a side-wheel steamer, as we do in front of McLaren's, Bronson's and Perley's docks, we set the

wheels going, and it moves out the sawdust. I have made four feet of water in about two hours in that way.

By Honorable Mr. Macdonald, (B.C.):

Q. You cannot clear the slabs out in that way? A. No.

By Mr. Christie:

Q. Do you know at whose instance it was the slabs were cut up in the hog machine? A. I understand it was done at the order of the Government.

Q. As a matter of fact you are using boats on the river now which are drawing more water than the boats did in 1870? A. Yes, we are drawing at least two feet more now, with the present facilities at Ste. Anne's, than we did in 1870.

Q. Do you never find any difficulty in the main channel? A. We did last summer between here and the Blanche.

Q. But was not the water exceptionally low last year? A. Yes, but last year was the first year we had the improvements down at Ste. Anne's, which gave us the increased depth of water down there, and we have made application to the Government to get the river improved to compare with the Ste. Anne's work.

By Honorable Mr. Macdonald:

Q. What is the nature of the difficulty to which you refer? Is there a sawdust deposit? A. No, it is principally gravel at the Green Shoals.

Q. Are there any slabs stuck in that shoal? A. No, not on this shoal. The only place where there may be a deposit of mill refuse in the channel is opposite Hillman's mill, and opposite the Blanche where there is still water, but not to any appreciable extent.

By Mr. Christie:

Q. Do you not know that the principal obstruction is caused by sand? A. I do not know. We have as much difficulty with sunken logs as anything else. We broke two propellers there last year with sunken logs.

Q. From the formation of the shore, is there not a very strong eddy setting in towards the entrance of the locks? A. Yes.

Q. And the mill refuse is incessantly washed in there? A. Yes.

Q. Is it not removed by the paddle wheels of steamers? A. Yes, but not effectually. There was a large quantity of it pumped out last year by a steamer. There is trouble every summer at the foot of the locks. It is the worst place on the whole of the river, as far as obstruction is concerned.

Q. Is it any worse there now than it was in 1870? A. No.

T. C. KEEFER, C. E., called and examined

By Honorable Mr. Clemons:

Q. You are a resident of this city? A. I am.

Q. How long have you been here? A. I have been in Ottawa continuously since 1864, but I came here first in 1845, and remained a number of years here.

Q. Will you please give us the benefit of your experience as to the conditions of the river at that time as compared with the present? A. When I first came here it was before the era of sawmills altogether. There were no commercial mills. When I returned here to permanently reside in 1863 or 1864 I purchased a piece of property below Rideau Hall Bay—the next adjoining bay. The shores were then entirely clean—rook, sand and gravel, and the beach sandy and gravelly. The bay was used for storing sawlogs. They could be floated in there and got at at any pitch of water, and floated out again. One year the Gilmours, on the Gatineau, rented that bay from me for that purposes; but of late years it has not been available to any extent because of the deposit of sawdust.

Q. What was the depth of water there when you first bought the property? A. The water was all depths. It began at the shore and went out to forty feet, but some years ago—probably ten years ago—I examined it, and at that time there was a deposit of several acres of sawdust out in front of this gravel beach, and the outer

edge of it was steeper than an ordinary sand bank, and forty feet in depth. I also built a road down at two points on this bay to get access to it to haul out cedars and building timber; but except at very high water I cannot approach within two hundred yards of the roads on account of the deposit of sawdust, and the boathouse I had there is useless from the same cause. It has not been used for several years. In fact it has been abandoned. The only place where we can get access to the river is on the rocky point where the current is strong, opposite Rockcliffe ferry. Then below Rockcliffe, at Hillman's mills, there was another bay, a valuable storage place for logs, and that is in the same condition at low water. There are acres and acres of it, just a mass of rotting sawdust, that you cannot walk on without sinking to your knees.

By Honorable Mr. Scott:

Q. Is that bed of sawdust exposed at low water? A. Yes, it is several feet out of water in low water, and all through the winter.

Q. Are there any other points on the river with which you are acquainted that have been obstructed by the sawdust and refuse? A. I have not examined any other part of the river. This point I am speaking of, McKay's Bay above the Government bay is in the same state—in fact it extends over a mile and a-half of frontage from the New Edinburgh mills to Hillman's mills below Rockcliffe, all in the same state.

By Honorable Mr. Botsford:

Q. Have there been any explosions in that part of the river? A. I have seen explosions when boating on the river, but I do not know that I have seen them in any of those places I have spoken of. I have seen them up nearer to the city.

Q. Are they dangerous to boats? A. If a boat happened to be very near them—a canoe or light skiff—some of the explosions are serious enough to upset them.

By Honorable Mr. Clemenow:

Q. You were employed by the Government before the saw mills were constructed? A. Yes, in 1845 when I built the slides at the Chaudière, that place was all covered with green cedars; and it was only after that, when the Honorable Mr. Merritt came into power that this water power was put in the market. The Government had held it as a reserve up to that time. That was in 1850.

Q. And all those obstructions in the river that you complain of were caused since the erection of those mills? A. Yes, as far as my observations in the lower part of the river go, it has all been caused since 1864 or 1865. I forget when the mill first became important on the river. There was no commercial manufacture of lumber on the river when I first knew it. There was just a couple of local mills at the Chaudière.

Q. Can you give us an idea of what the effect on the river will be if this deposit of mill refuse continues? A. I have no doubt that the annual freshets will assist to keep the main channel clear, especially with the aid of a little dredging at the bars; but gradually, if this thing continues the bays will fill up. Sawdust floats, and a large proportion of it is blown into the bay and cannot get out, and remains there until it rots. The bays are nearly all as full as they can be. The remainder must settle in the channel somewhere or another—that is in the deeper portions of the channel, and as it levels them up it must begin to contract the remainder of the channel, so that it is a process which will hinder navigation sometime or another. The only point about it is, that it is of a character that the paddle wheels or screws of a vessel can work in it, and they will wallow a hole in it and wear through in time. It is not like a sand or mud bar.

Q. Have you noticed the effect of the hogging process on the refuse? Does it not sink through to the bottom? A. That binds the sawdust and makes it more solid and less likely to change its place, or for the current to act upon it.

Q. Have you any knowledge of the effect it has had upon the fish? A. I knew that fish are very scarce—we cannot get any now.

Q. How was it in the early days? A. They were very plentiful then. I do not think any respectable fish would come up here now. The shad used to come up in my early days to within 18 miles of Ottawa.

By Honorable Mr. Haythorne :

Q. It is your experience that those deposits you have described are gradually extending? A. Yes, they must, there is so much sawdust going into the river, and I do not think it will be carried over the Long Sault Rapids or down the river. When it fills up all the bays, it must then fill in the channel in the course of time. It is merely a question of time and the extent of the sawing, whether lumber gives out before the channel does.

Q. A few miles below Ottawa, where the river widens out, the current is not very strong? A. The current is very strong down below the mouth of the Gatineau; then the river widens out, and it is shallower with sand bars. Gatineau village is built on the delta at the mouth of the Gatineau River.

Q. Can you give us an idea of the possibility of disposing of the sawdust in some other way without incurring large expense? A. I do not think burning is a very expensive process, except the getting of a site for it in this place. The ground is so occupied that it will be necessary to diminish the piling grounds at the mills, or to construct furnaces at the river's edge. I do not think there is any difficulty about it. The expense of the plant necessary would be very slight. The appliances for getting it from the saws and taking it to the furnace would be the principal question. The saws are not probably high enough above high water mark to convey it readily to the furnaces, but I have never looked into the question to see how furnaces could be used.

Q. Is it within your knowledge that sawdust can be converted to some other valuable purpose besides fuel? A. Yes, it has been used for paper pulp, and it is also used in connection with petroleum for patent fuel.

By Honorable Mr. Smith :

Q. Did you ever try it for bedding for horses? A. Yes, we have forty horses here for the street railway, and for the last 18 years we have used no other bedding but sawdust. I consider it the very best material for stables.

By Honorable Mr. Scott :

Q. Have you ever given any thought to the conversion of it into the methylated spirits as the Rathbun Company is doing? A. No, but I have seen a statement that it is being used for that purpose.

By Honorable Mr. Clemons :

Q. Have you ever considered whether it has any ill effect on the health of the locality, where this mass of refuse is allowed to accumulate? A. When the epidemic at Ottawa last year was ascribed to the water, I was satisfied that it could not be the cause. The Ottawa River flows with a strong current, and is decanted from a series of lakes above here, and no water could be in a better condition, unless it could be poisoned by mills above here. I have not examined the amount of sawdust deposited in the river above Ottawa, but I do not know of anything to poison the water in any way. It would have to come in contact with decayed sawdust for a long time to produce that effect. The doctors ascribed the epidemic to the water, because it was so universal that they could not ascribe it to any local cause; but I think that as the water is not used generally by the people except in a boiled state, and the air is used by everybody, I think the air is where we should look for the cause of the difficulty. Ottawa is peculiarly situated to be affected by its atmosphere, in the dry summer, such as last summer was especially. It is almost entirely surrounded by water, and most of that stagnant water. There is on the south-west Dow's Lake; then there is the Rideau Canal, and its filthy gullies, and the Canal Basin, and the Rideau River which about its mouth is a dead pond which is used to receive the water of the by-wash; then on the north we have the river with its vast mass of sawdust along its banks, and when that is left dry and exposed to the heat of the sun, if anything can affect the atmosphere that should do so. We know that in water reservoirs the water is poisoned under the same circumstances by allowing vegetable matter to accumulate so that it is necessary at times to deepen them and lime them, and every town supplied with water by gravitation has that difficulty to contend with.

By Honorable Mr. Haythorne :

Q. Did you ever consider the practicability of removing those deposits? A. I do not see any way of removing them unless they can be dredged. I think that when you get inside, away from the fresh deposit, that the bank is so solid with its mixture of mud and slime that it would be dredgable material. The outer side would be loosened and scattered, and the only way I know of would be to keep dredging at it during a high water when there is a strong current and keep sending it down the river?

Q. Would not that lodge down below again? A. You would have to keep it moving wherever it stopped.

Q. If it is an injury here it would be an injury below? A. It would be spread over such a large area in the lakes below, that it would not be so injurious. But of course there would be no use in doing that unless you stopped the practice of throwing the stuff into the river from the saw mills.

Q. Do you not think that would be the most effectual way of stopping the deposits? A. That would be the necessary way. If it were scattered by dredging, and all put below water it would soon disappear entirely. It is the exposure of these deposits at low water to the action of the atmosphere and the heat of the sun that affects the health question.

By the Chairman :

Q. But the depositing of sawdust in the river must be stopped? A. Yes, I believe it is a great folly to be removing it at one end, and supplying it at the other.

Q. You speak of there being no sawdust in the river above the city. I believe they are not allowed to deposit any sawdust in the river above the Chaudière? A. I have not visited any of those mills, but I understand that the old Skead Mill is a steam mill, and so is the one at Masons; and the Water Works Act prohibits anything of that kind from being deposited in the river six miles above the Chaudière. The sawdust from Hillman's mill is not put into the river. It is only where they have water to carry sawdust and refuse into the river that the mill owners send it there. A steam mill can get rid of it cheaper by carting it out and burning it than by putting it into the river. It is to the steam mills we look for our supply of sawdust generally, because they have piles of it, but at the water mills you can only get it while they are sawing.

By Honorable Mr. Smith :

Q. Do not the steam mills burn all their sawdust? A. Yes, at Gilmour's mill down here they burn all their sawdust, and at Edwards' mills at Rockland their sawdust is burned. There is no difficulty with the sawdust in the steam mills; they burn it, and that is the only way to deal with it economically when it is not thrown into the river. Of course if you could market it—manufacture it into anything that would sell—it would be better, but I doubt if it would stand the cost of freighting it away from here.

By Honorable Mr. Haythorne :

Q. I think you said that if the sawdust banks were dredged and the stuff was once moved out into the current, it would go down the river. Could its motion be controlled in such a way as to allow it to be deposited in some place where it could be more easily removed? A. My idea is that if you dredge the face of these banks, which are forty feet deep in some places along the river, into a certain distance, then you would find the sawdust would be solid enough, mixed as it is with river mud and silt, to be loaded on to scows in the usual way as dredged material. Then it would have to be dumped in some way into deep holes in the river, or carted on shore, which would be expensive. I think the proper way would be to dredge out the bays and scatter the material over the river, removing it from the channel, wherever you found it encroaching. Of course where it is mixed with sand or any material that could be lifted in the dredge bucket, it could be scowed off. If it goes on as it is now there will soon be no part of the river to deposit it in. Of course some parts of the channel are very deep. Opposite the mouth of the Gatineau it is seventy feet deep, but when you get below Kettle Island it is not more than five feet in low water. If

this stuff were levelled over the bottom between here and the Gatineau, and the banks were cut down to a couple of feet below water line, so that no lowering of the river would expose it to the action of the sun and atmosphere, it would cease to be dangerous to the health of the city.

By Honorable Mr. Smith :

Q. Does the city authorities permit the depositing of stuff from the yards on the ice in the winter—night soil and yard rubbish? A. I do not know what they are doing the last year or two; but it was a common practice until very lately to deposit such stuff just in front of these buildings from the Queen's Wharf and on the Rideau, the ice used to be covered with it in the spring of the year.

Q. From Hull or Ottawa or both? A. From both sides. I have seen it going down from this city, but I do not remember exactly when. Of course, before the main sewer was built, and the waterworks were built, it was all disposed of in that way.

By Honorable Mr. Botsford :

Q. Where does the main sewerage of Ottawa empty? A. Through McLaren's mill yard below Sir John Macdonald's residence. The main sewer leads into this valley directly down from here—between here and Maria Street goes under the canal, and through Lower Town on the line of the old by-wash, through Queen Street and then straight out into the Ottawa River at McLaren's lumber yard.

By Mr. Christie :

Q. Has it not been noticed that of late years since the lands have become very much more cleared up the Ottawa that the springs floods come down in a greater rush and in less time than previously? A. Yes, I think that the effect of the clearing of the forest is to throw a much greater quantity of water at the same time in the river, in the month of April for instance, than before the clearing of the forests. It lets off the rain water at all times of the year more rapidly than when the roots and trees were there to protect the water from evaporation. The great cause of the sudden and destructive freshets we have had on the south side of the river is the sudden melting of the mass of snow when the hot sun comes on it in the middle of April. That snow is converted into water very suddenly and it is rushed into the streams.

Q. When it is rushed into the streams in that way has it not a tendency to wash down large quantities of sand with the ice? A. It depends upon what the banks of the river are composed of.

Q. Is it not a fact that the erosion of the banks on both sides is very perceptible? A. I do not recollect any sandy shores on the Ottawa in this neighborhood.

Q. Are there not large quantities of sand brought down the Gatineau River? A. Undoubtedly the whole bottom of the Gatineau where the piers and booms are, is an immense deposit of sand, and that comes from some point above.

Q. On the Ottawa River here is not the water very much discolored in the spring floods, indicating a large quantity of earthy matter in suspension? A. It is not very much discolored—not more than other rivers are from the wash of the shores, and I think they are naturally clay and rock.

Q. Would not that deposit naturally fetch up the shoals and bays along the river banks—whatever debris would be brought down by floods? A. I do not think it would be carried any distance at all. The sawdust goes into the bays because it is driven off there with the wind. The sawdust goes in on top of the sand and sinks it to the bottom.

Q. Mr. Gray in his evidence says there are large quantities of sand mixed with the sawdust in these deposits, but if the shoals are filled up and the bays along the river are filled up, I suppose that would only make the current in the main channel all the more swift? A. No, it would not affect the current in the main channel. A bay with dead water is pretty much the same as a channel without bays.

Q. If the bays were filled in, and the same quantity of water having to go through, would it not go through more rapidly than if the bays were not filled in? A. The bays are not the channel. They are out of the line of the channel, and if

hey did not exist at all the channel question would be the same except that the water as it rose would have a little of the surface of the bay to relieve it and it would not rise quite so high as it would if there were no bays.

Q. Not having the bays the water would be a little higher and be more rapid?
A. Yes.

Q. So far as you have been able to gather the main channel has not been materially lessened by that deposit? A. Not from what I have observed. In fact I have not observed it at all. It is only from the examination of the bottom of the shoal places that you can tell whether the sawdust is encroaching on it or not.

Q. Don't you think that from the class of material thrown in, that a current of four or five miles an hour would naturally keep it in motion? A. If it were fresh, but if it sinks and becomes mixed with the silt and mud of the river I don't think the current would start it. It would carry it off if it were turned up by a dredge or paddle wheel or screw.

Q. Supposing a scheme for the burning of the sawdust here were to be undertaken, would it be necessary to remove the sawdust as it was made to a distance from the city or would it affect the insurable property of the city if it were consumed here near at hand? A. That is a question you would have to ask the insurance companies. What I would say is it ought not to affect the insurance at all, for of course the furnaces would have to be placed in a safe position and constructed so that there would be absolutely no danger from them. So I do not see any difficulty in that. It is just a question of the space the furnaces would occupy and the expense of bringing the material to the furnaces.

Q. From your long residence in Ottawa, has it not been your experience that the city is quite up to the average of cities in health? A. I think so. I think Ottawa is as healthy a place as there is in America.

Q. And the opinions regarding the cause of the fever that was prevalent here last year vary? There has been no decision at all respecting it? A. No, the Board of Health of Ontario has decided practically that it is the water. I think it the air and must lie between the effect of the dry summer on the stagnant water and these deposits or the sewage of the city.

Q. The sewage system is practically new in Ottawa is it not—that is the large development of the sewage system? A. A good deal of it is new, but I do not think the new part of it would give any trouble. It is probably the old part of it that would be most dangerous. The question of how far the sewage affected the epidemic that was here last year has never been satisfactorily investigated.

Q. I suppose in your experience the fishing interest along the Ottawa has never been much? A. No.

Q. It was merely just for supporting purposes? A. Yes.

Q. Are you familiar with the fishing along the Hudson—the shad fishing? A. I do not know anything about it only that I have seen the nets set out there.

Q. And I suppose the sawdust of the Hudson is in greater quantities than it is in the Ottawa? A. I should not think so, and the shad fishing is a long way from the sawdust deposit. The shad are in tide water and the sawdust is away above it.

By Honorable Mr. Scott :

Q. How high up does the tide affect the Hudson? A. It affects it up as far as Albany, although the water is not salt.

Q. Would not the sewage of the Hudson affect the fishing? A. No, I think the sewage would attract fish. It is the sawdust that gets into their gills that interferes with the fish. Sand has the same effect. That is what drives fish away, any impurity in the water that gets into their gills; but as for sewage anything that enriches the water I think they rather like.

By Honorable Mr. Smith :

Q. Have salmon ever come up this river to your knowledge? A. No, the salmon keep the St. Lawrence. They do not like the Ottawa River. Shad used to be caught down at Long Sault the same as at Lachine some years ago; they used to be found in the sand shoals above Grenville. I know that some years after I came

here they used to scoop them along the shore at the Long Sault. I do not know whether they have abandoned the river altogether or not; but whether it was the sawdust or the water I don't know which, but they abandoned the Ottawa and followed the St. Lawrence. Salmon have ceased to come above the mouth of the river Ottawa for many years.

By Honorable Mr. Christie :

Q. The permanent injury that you refer to on the Ottawa from the sawdust deposit is in the bays and shoals along the shores? A. In my case it is a very serious damage to me. It renders my river front not only valueless to me but a very great nuisance. I had made roads to it for the purpose of using it for commercial purposes and I had a boat house built which has been rendered useless and the river lots cannot be sold for residences as they could have been if the sawdust were not there

DENIS MURPHY, of the City of Ottawa, called and examined.

By Honorable Mr. Oleson :

Q. How long have you resided in Ottawa? A. Twenty-two years.

Q. What is your business? A. Forwarding.

Q. Can you give us any information about the subject of this enquiry? What was the state of the river when you first came here? A. When I came here 22 years ago the bays at the foot of the river were not as full of sawdust as they are now.

Q. The mills were all constructed? A. Yes.

Q. So the nuisance has been continuing for thirty years? A. I can only speak for 22 years.

Q. And during that time the nuisance has been continuing? A. Yes, the bays have been filling up ever since.

Q. Last year was very low water? A. Yes, we had a great deal of difficulty last year.

Q. Do you know that the sawdust has been dredged from the foot of the locks here? A. Yes, I know it has been dredged two or three times and they have taken away sawdust and slabs. I cannot say that we have any particular trouble in the channel; the trouble is around the mouth of the locks and from here to Gatineau Point the sawdust has been a big trouble.

Q. Do you mean to say that you would have had the same trouble if the sawdust had not accumulated? A. We would have had the same difficulty opposite Hillman's mill, where we had the bulk of our trouble last year. We find gravel and sand or stuff of that sort on that shoal and it has been that way for a number of years.

Q. Was it dredged last year? A. No.

Q. Then how do you know it was sand and gravel? A. That is what I found there.

Q. Did you make an examination of it? A. Yes.

Q. What was the result? A. The men say it is a sand and gravel shoal.

Q. With no mill refuse? A. No; they speak of it around the bays. Our big trouble has been here at Ottawa and at the foot of the locks and at the mills from sawdust.

Q. Trouble does exist any way? A. Yes.

By Mr. Christie :

Q. As a matter of fact, how many times do you know of the foot of the locks having been dredged? A. I think once by a dredge and once by a steamer with a scraper, and last year I think it was pumped out by a steamer.

Q. That is during the last twenty years? A. Yes; to my knowledge, during the last 22 years.

Q. Have you sometimes cleared away the sawdust from the docks with the paddle wheels of your steamers? A. Yes.

Q. And forced it into the channel? A. Yes.

Q. During the 22 years you have been in business you have not found the main channel impeded? A. No.

- Q. Was not the last season a season of very low water? A. Yes.
- Q. And the general difficulty you had was purely with the shoals and bays? A. Yes.
- Q. Is the navigation between here and Grenville any worse now than it was at any time during the last 22 years? A. No; not in the main channel.
- By Honorable Mr. Haythorne:*
- Q. The navigation must now be confined to the main channel? A. Yes; principally. Of course we find sawdust in the bays when we have occasion to go in there.
- By Mr. Christie:*
- Q. You use boats with a heavier draft now than you did 20 years ago? A. Yes.

JOHN BRYSON, M.P., called and examined.

By Honorable Mr. Clemon:

Q. What is your occupation? A. I am in the lumber business and have been for some years.

Q. How long have you been in this section of the country? A. I was born in the valley of the Ottawa. I have been engaged in the lumber business since 1872.

Q. Can you give us the benefit of your experience with reference to this sawdust question? A. I know very little indeed about the sawdust question except around the locks here and down the river a short distance. I found in taking down square timber that it very seriously impeded the working of the cribs. After getting through the slides we had great difficulty in banding our cribs together. Occasionally when a piece of timber comes out of the bottom of a crib it is impossible to get them back again in consequence of the sawdust running into the cracks of the cribs, and we have been obliged to move away from the city before banding them up.

Q. That is here at the city? A. In this eddy at the foot of the locks particularly. The eddy is very strong and a raft after it is partially banded leaves a blank between where the timber is tied and the shore and after you have been there a day or two it is impossible to get loose sticks in.

Q. You had no experience prior to the building of the mills at the Chaudière? A. No, but at the foot of the other slides above the Chaudière there are none of those difficulties. At Carillon below and at Calumet and the Chats we have no difficulty.

By Honorable Mr. Macdonald, (B. C.):

Q. You do not find any sawdust in the river above the Chaudière? A. No, most of the mills above the Ottawa are steam mills and they consume their own sawdust.

By Honorable Mr. Clemon:

Q. There is no refuse or sawdust put into the river from the mills above? A. I never experienced any difficulty from sawdust anywhere but here. I have seen the sawdust so thick on the river that it is almost impossible if there is any head wind for a raft to go into the channel at the Long Sault. I have seen five or six or eight inches of sawdust under the cribs when there would be a head wind.

Q. There is a large deposit of sawdust there? A. It accumulates under the cribs and you see it coming out from under them as we move into the swells and strike the first descent of river.

By Honorable Mr. Macdonald:

Q. Do your rafts ever ground in the river? A. No, unless they are driven into the bay by stress of weather. The steamers are able to keep them in the channel. There are very few rafts taken down to Grenville now without steamers. They are all towed.

By Mr. Christie:

Q. You have never been engaged in the milling business? A. No.

Q. When your timber comes down in the summer time it arrives in the season of very low water—lower than in the spring time? A. I cannot say that we have ever been here just when the water was at its full height. I have been here in June.

Q. I suppose the quantity of timber brought down now is very much less than formerly? A. Yes, very much less.

Q. Is there a very large quantity brought down now in rafts? A. A very limited quantity at the present time.

Q. The bays around Ottawa were formerly used I suppose as a convenient place for banding the cribs together after passing the slides here? A. Yes.

Q. And the difficulty is found there in arranging the cribs after they pass through the slides? A. Yes, there is great difficulty found in that now.

Q. Do you know whether Conroy's mill, this side of Aylmer, is a steam mill or not? A. It is a water mill.

Q. And they throw their sawdust into the river? A. I do not know. We run the rafts on the south side of the river.

Q. The McLachlan mills up the Ottawa, are they run with steam or water power? A. I think they have both. I agree with the gentleman who was examined last that the snow goes away more quickly in the spring of the year in consequence of the country being denuded of its forest. But there is another reason for it. When the lumbermen send up their men in August or September to prepare for the winter work they begin to improve the creeks and they shut down all the dams on these streams, and there is very little water comes out of the northern tributaries of the Ottawa after the middle of August until the following spring. Then when the lumbermen commence driving their timber in the spring, about the 15th May—they all begin about the same season—the stop logs of these dams are lifted about the same time, and it causes an extra pressure of water on the river.

Q. That would cause a large quantity of sand to come down and form shoals? A. No, I do not think the banks of the Ottawa are sandy.

Q. But these floods coming down the creeks, would they have a tendency to bring down sand and debris? A. Speaking of the portion above the Calumet, I do not think that would be the case. They seem to have as much water there in low water now as formerly.

The Committee adjourned until to-morrow at ten o'clock.

OTTAWA, Tuesday 15th May, 1888.

WILLIAM G. ADDISON called and examined.

By Honorable Mr. Clemow?

Q. What is your occupation? A. I am lockmaster.

Q. How long have you been a resident of this city? A. About sixty years.

Q. You know all about this river? A. I know considerable about it.

Q. You have been on the river a good deal boating, I believe? A. Yes.

Q. Just give us an idea of the character of the river before the saw mills were erected? A. Up to the time I quit boating there was no trouble at all in the river.

Q. How long ago was that? A. About 20 years now since I quit boating.

By the Chairman:

Q. How far back does your memory extend with regard to the river and its condition? A. Thirty years.

Q. What was the condition of the river at that time? A. It was clear in the bays and everywhere else.

Q. Was there any sawdust? A. There was no sawdust. Coming up the river from Grenville all along the sides of the river you would find stacks of edgings and slabs piled up all along the edge of the shore. Within the last thirty years the sawdust has accumulated. At the foot of Pine Tree Island at that time there was 40 feet of water, a year ago last fall the sawdust was over the water to nearly opposite the foot of the locks.

Q. Give us the extent of it in feet as near as you can come to it? A. Fully 300 feet from the island to the point.

Q. What height was it above the water? A. About one foot or 18 inches. The men walked about on it picking up the edges.

Q. And it extended 300 feet in length? A. Yee. Then the sawdust began to work into the eddy at the foot of the locks, and where there was 40 feet of water there, we had not more than five or six feet now. In 1381, I think they gave a contract to Mr. Askwith and he made a large wrought iron scoop—a very large one—and placed it between two barges on a swivel, and he had crabs to hoist it up. He had two steamers. He backed that into the mouth of the lock, dropped the scoop and hauled the refuse that was in the channel out into the river to deep water. He made a channel about 12 feet deep all over in low water. He took the sawdust away to that depth all over the bay.

Q. Do I understand you to say that the channel was obstructed? A. Yes, I have been four and five hours getting a boat into the lock, and sometimes have had to unload them. Some boats drawing four and a half to five feet of water came there and could not get in.

Q. When was that? A. That was the year before last, and it was the same last fall. When the water got low last fall, between the foot of the lock and Stirling's wharf there was about 25 feet square of sawdust clean out of the water altogether. We never experienced so much trouble with the sawdust until they got the hog machines in the mills. They cut the slabs and edgings up into small chips, and they came with the sawdust, and being all sap they would sink immediately or in a very little time. The prevailing wind in the fall of the year is from the west and north-west. I have known it to blow for weeks steadily from west, for I take the course of the wind regularly every morning, and it is sent into the Department. I do not know very much about the river far down, but on the Hull side of Kettle Island, we used to come there with our boats and barges at one time. I was down there last fall and really I wondered to see the state it was in. No boat could get in there now.

Q. Could not row boats? A. Well, a row boat could get in of course.

By Honorable Mr. Clemon :

Q. The Government have had to employ dredges on several occasions to clean out the sawdust? A. They employed Heney & McNamee's dredge but did not do much good. The scoop of the dredge does not work well in that material. It used to catch on the slabs and edgings and slide along on them.

Q. I suppose you have seen large amounts of sawdust on the other side of the river, opposite Batson & Currier's old mill? A. I have seen great quantities of sawdust on that side. I saw the ice blow up there once for about an acre, and pile up the ice in blocks three feet square. They had a race track from there to Gatineau Point and the explosion took place the night before the race was to come off, and the whole place was totally destroyed. I do not think there is much sand comes from upwards down this way. I think it comes principally from the Gatineau. I have seen a barge run aground in the evening and you could not get her off; the next morning men could walk on the sand around that barge. They dug a hole under the bow and another under the stern and by-and-bye the sand would begin to go and in the course of a couple of hours the barge could swim about, so I think it is from there the principal part of the sand that lodges this side of Kettle Island comes, and at the head of Kettle Island in the bay there.

Q. Last year the water was pretty low? A. Yes.

Q. Did you discover any unpleasant odor from the accumulations of mill refuse at the foot of the locks? A. Yes, when you would have a blow up. I was standing on the pier one day and saw a white swell coming up. There was an old Frenchman approaching with a bun. The water rose about ten or twelve feet square and lifted him fully three feet out of the water.

Q. What size was the boat? A. It was a square punt, about 14 feet long and 5 feet wide, with a flat bottom. They use them for gathering mill wood. The wind happened to be blowing from that direction, what little wind there was, and the smell was very bad. I measured around in the bay at the steamboat wharf under Nepean Point and there was 30 feet of water and no bottom with my lead line.

Q. When was that? A. I think that was in 1881.

Q. How is the water now? A. There is hardly any water there at all. The sawdust is over the water all summer, in fact. It is full always. As the sawdust comes down the river, the wind blows it in there and it cannot get out.

Q. Do you consider that the sawdust is destroying the navigation of the river? A. I do most undoubtedly.

By Mr. Christie :

Q. When you say that you made an examination some years ago as to the depth of the river, what season of the year was it? A. On the ice in the fall.

Q. In 1881? A. I think it was in 1881, but I am not sure, because I have no memorandum of it.

Q. Did you break the ice to make measurement? A. Yes, I cut holes.

Q. Who told you to do it? A. I was sent by the Department.

Q. You made an examination for the Government? A. Yes, Mr. John Porter had charge of the work.

Q. Have you made an examination since? A. No.

Q. Did you make any other examination in the same season of the year since 1881? A. No, but I measured the water at the foot of the locks.

Q. Can you say that there is any difference in depth at the same point in the same season of the year now from the depth you found in 1881? A. Yes.

Q. You know that from examination of the place? A. Yes.

Q. At what time of the year did you make this examination as to the depth at Pine Tree Island? Was it in the spring or in the fall? A. In the fall of the year.

Q. You say that 30 years ago there was a depth of 40 feet of water at Pine Tree Island, from your examination? A. Yes.

Q. That was about the time that Mr. Shanley was surveying the river here—do you remember that? A. No.

Q. When did you make an examination to find that the sawdust was over the water? A. We did not want to make any examination whatever. The sawdust was visible, and men could be seen walking over it.

Q. When was that? A. In the fall: all our low water is in the fall of the year.

Q. At this season of the year no sawdust appears above the water? A. Certainly not.

Q. Could you give the committee an idea how much water there is at the foot of Pine Tree Island now? A. There might be 15 to 18 feet.

Q. Can you tell me how much the water in the Ottawa River rises and falls at the foot of the locks here? A. Some years we will have 25 feet in the spring freshets and it will get down to five feet in the fall.

Q. Last year what was the depth—you know last year was an exceptional year? A. No, I could not tell exactly.

Q. You made the measurements? A. Yes, but I cannot remember everything. I could tell you by referring to my books.

Q. Have you a record of the depth of the water? A. Yes, taken every year from spring to fall.

Q. Is it not a fact that the water rises and falls very much more rapidly now than it did 25 years ago owing to the clearing of the woods? A. Some years it takes considerable time to fall.

Q. Is not that the effect of the clearing of the country? A. It is natural to suppose that it is.

Q. Comparing this time with 30 years ago does not the water come down in the spring in greater volume; fall more suddenly, and become very low in summer? A. Some years we have good water the whole season of navigation.

Q. You have a record of the depth of the water which you can show to the committee? A. Yes.

Q. You take soundings at the foot of the locks, I believe? A. Yes, the water is measured at the sill every morning.

Q. Is not the water measured out in the channel every year? A. Not at all.

Q. Do you not make an examination? A. No, I have no business with it.

Q. Have you ever made an examination? A. I have often when a vessel was aground gone out and measured the depth of the water and found the sawdust piled around her.

Q. Was the sawdust on the surface of the water? A. No, it is all underneath.

Q. When a boat comes in to the locks, does it turn up the sawdust? A. Yes.

Q. Can you see sawdust at the foot of the locks at this period of the year? A. No, only what comes in fresh.

Q. Could you tell the Committee whether by soundings at the foot of the locks, you could get sawdust there now? A. Yes, you could tell the very minute a rod touched it.

Q. You could bring evidence of that to-morrow to the Committee—that there is decayed sawdust at the foot of the locks? A. I do not know. It would require a very long pole.

Q. Would not that be the best test? A. No, there would be no test about it.

Q. How much water is there in the channel, at the foot of the locks now? A. We had 20 feet on the sill this morning.

Q. Would not that be 20 feet right through the channel? A. No.

Q. How much would it be right through the channel? A. At the very most there is 15 feet of water in the channel now.

Q. And it will be getting higher yet? A. The water is rising.

Q. When you speak of this hog machine, do you know how long it has been in use? Has it been in use for the last 8 or 9 years? A. Yes, that was done to prevent the slabs and edgings from going into the river.

Q. Have you found any embankments down the river caused by throwing refuse into the river? A. I am not in the habit of going down the river.

Q. You said you had been at Kettle Island? A. I was at the head of Kettle Island last year, and that was the first time, for a long while.

Q. Did you see slabs and edgings down there? A. No, I just saw the sawdust.

Q. Was it loose? A. What I saw was loose.

Q. Was it old or new sawdust? A. It was new of course.

Q. Could you see any sawdust now over at Pine Tree Island? A. No, certainly not.

Q. How deep would it be over there? A. There might be 10 or 12 feet there.

Q. Would there be a current there? A. Not at the foot of the island.

Q. But on both sides of it there is a strong current? A. Yes, and there is an eddy at the foot, and that is what causes the sawdust to accumulate there.

Q. Do you not take measurements in the channel for the Government every year? A. No.

Q. Are not measurements made there every year? A. Not that I know of.

Q. Do you know who does most of the business now coming up the canal—which class of merchants? A. The lumber merchants.

Q. I suppose the trade on the canal is altogether in lumber? A. Yes.

Q. And down the river it is nearly all lumber, with the exception of Captain Bowie's boat? A. Yes, and the "Olive," the "Welshman" and the "Harry Bate."

Q. These are all lumbering vessels? A. No, they are freight boats.

Q. This bad odor that you spoke of, I suppose, was just a little gas that came up after the explosion? A. Yes.

Q. They are all healthy people at the foot of the locks? A. Yes.

By Honorable Mr. Clemon:

Q. As I understand, you were navigating the river before the construction of the mills? A. Yes.

Q. And therefore you knew the condition of the river at that time? A. Yes.

By Mr. Christie:

Q. Do you know if the Government made an investigation of the river in 1878? A. No, I do not know that. They might make fifty and I would not know anything about it.

WILLIAM BESSERER called and examined.

By Honorable Mr. Clemow :

Q. Where do you live? A. I live in Gloucester.

Q. How long have you been living there? A. I have been there now about 20 years.

Q. Can you tell us the condition of the river before the sawmills were erected and its condition now? A. It does not lie in a very nice state at present with the sawdust.

By the Chairman :

Q. What was your first acquaintance with the place? A. The river was in a very good condition for navigation when I first knew it. There was nothing to hinder navigation when I first saw it. Of late years the sawdust has accumulated. It is something fearful in the channel of the river in some parts.

Q. In the channel? A. Yes, down at the Leonard Islands, for instance, and at the mouth of the Blanche the sawdust has accumulated very much, blocking the channels between the island where it used to be navigable at one time. Now you cannot go there.

By Honorable Mr. Clemow :

Q. What was the state of the river last fall? A. Last fall it was in a very poor state. There was an awful accumulation of sawdust then.

Q. How much water was there in the river at that time? A. Just by the Blanche there would not be much more than four or four and a half feet.

Q. What was the depth there 20 years ago? A. There would be quite a channel there then. Of course I never measured it then.

By Mr. Christie :

Q. You do not know what the river was like 20 years ago? A. I was born there.

By Honorable Mr. Haythorne :

Q. You had no occasion to measure it then? A. No, I took no interest in it then.

By Honorable Mr. Clemow :

Q. You had no difficulty in navigating it then? A. No. There is an accumulation of sand and sawdust. It forms a layer of sawdust and a layer of sand, and it holds there. If you dig in it you find it that way for 10 feet down.

Q. I suppose you come across occasional slabs? A. Yes, occasionally we come across slabs and edgings that have got water-logged and sank down.

Q. And this material from the hogging machine? A. Yes, and from the edger. The way I found the sand and sawdust there when I went to get sand. This sawdust has been a great nuisance and it has been increasing from day to day. In fact some days if the wind happens to blow from the north to the south shore you cannot get out with a small boat.

Q. What effect has it had upon the fish of the river? A. It almost banishes them altogether. There is hardly any fishing of any kind on the Ottawa at all now.

Q. And was there good fishing in the Ottawa at one time? A. Splendid.

Q. As much as people require? A. All kinds, from pickerel down—all good fish.

Q. Did you discover any ill effects from this nuisance of sawdust in the way of health in your locality? A. In the cool of the evening about the wharf there the stench would be terrible. In fact the water is bad.

Q. Has it caused any disease, any typhoid fever? A. There were a couple of cases in the Murphy family. There was one man who did not do a hand's turn the whole season from it.

By Mr. Christie :

Q. Are you a farmer? A. Yes.

Q. And where is your farm? A. Down in Gloucester.

Q. How far from Ottawa? A. About 8 miles.

Q. Have you been a farmer all your lifetime? A. Since I have been there—19 or 20 years.

Q. Were you engaged in any other occupation except farming since you have lived there? A. No, I have nothing to do with the navigation.

Q. Can you tell where the channels are? A. Yes, some of them.

Q. Can you say whether any portion of the channel where the navigation is carried on there is anything to stop navigation? A. There is, in sawdust and slabs.

Q. Did you ever find by examination of those channels, whether there was any stoppage of navigation? A. Certainly, when the water would get down low, to a certain pitch.

Q. The boats could not go down? A. The boats could not go down with this nuisance in the river.

Q. The sawdust comes up to your farm does it not? A. Yes.

Q. And is a nuisance to you there? A. It is a nuisance to every person along the river.

Q. Do you know whether there is any difference in the last 10 years as to the character of the refuse coming down? A. There is a great difference: it is sawdust now instead of slabs.

Q. Do you see edgings and slabs coming down? A. Yes, but there is a big difference in the number of edging and slabs coming down now. There were far more in former years, but a good many are still coming.

Q. Do you know what Mr. Clemow meant when he spoke of a hogging machine? A. Yes, that is a machine for cutting slabs with.

Q. So that a slab, after going through the hogging machine is no longer a slab—is sawdust? A. No, it is cut into chips.

Q. You spoke about sand being mixed with sawdust: I suppose the sand comes down the Blanche River? A. No, I think it comes down with the freshets and when the water rises during the summer.

Q. Have you noticed any difference in the Ottawa River of late years—that it rises more rapidly and falls more rapidly than in former years? A. Some years it comes with a rush, and sometimes it does not, but I think the lumbermen control it now with their dams above.

Q. Does not the clearing up of the country around here make a difference? A. It does to a certain extent.

Q. That is to say, the water rises more suddenly in the spring and gets lower in the summer. A. I do not think it would have that effect; the effect it would have, would be to let the snow melt early in the spring.

Q. With regard to this sand mixed with sawdust, do you find it there in layers? A. Yes, I can show you it on the clay bank at our side of the river. The wind disturbs the water and the sawdust is thrown on the shore and stays there.

Q. Is there any sawdust in the channel of the river now? A. I do not doubt it at all. You cannot see any sawdust in the channel now; a man would want good eyes to look down in the channel and see what is at the bottom when the water is high, but if you come down in the summer, I will show you lots of it.

JOHN TILTON called and examined.

By Honorable Mr. Clemow:

Q. You are the Deputy Minister of Fisheries? A. Yes. There are two reports on this question, one made in 1873, which I think is Mr. Killaly's report, and the other was made in 1878, by Mr. Mather. I brought over copies of both for the use of the Committee.

Q. These reports were made at the instigation of the Department, I believe? A. At the instigation of the Government.

Q. Do you know anything respecting this question of sawdust in the Ottawa river? A. Generally. I understood that the line of information you desired from me was particularly the circumstances under which these exemptions were made and what other exemptions existed as well as that of the Ottawa. The exemptions are made under Chapter 91, of the Statutes of 1886, "An Act respecting the protection of navigable waters."

The seventh section of this Act provides:—

“No owner or tenant of any sawmill, or any workman therein, or other person, shall throw or cause to be thrown, or suffer or permit to be thrown any sawdust, edgings, slabs, bark or rubbish of any description whatsoever, into any river, stream or other water, any part of which is navigable, or which flows into any navigable river; and any person who violates the provisions of this section, shall, on summary conviction, be liable for the first offence to a penalty not less than \$20, and for each subsequent offence to a penalty of not less than \$50. The several fishery officers shall from time to time examine and report on the condition of such rivers, streams and waters, and prosecute all persons violating the provisions of this section; and for enforcing the said provisions, such officers shall have and exercise all the power already conferred upon them for like purposes by the Fisheries Act. The Governor in Council, when it is shown to his satisfaction that the public interests will not be injuriously affected thereby, may from time to time, by proclamation, published in the *Canada Gazette*, declare any such river, stream or water, or part or parts thereof, exempted from the operation of this section in whole or in part, and may from time to time revoke such proclamation.”

Under that section of the Act a report was made to Council and a proclamation issued, which appeared in the *Canada Gazette* of the 25th of April, 1885. After reciting the Acts respecting the protection of navigable streams and rivers and the powers of the Governor in Council under the Act, the proclamation continues:—

“And whereas it has been represented to us that the public interest will not be injuriously affected by exempting from the operation of the said Act all that part of the Ottawa River lying between the Chaudière Falls and Mackay's Bay, and also all that part of the Gatineau River from the mill pond above Gilmour & Co.'s mill at Chelsea to the mouth of the said Gatineau River, so far as regards sawdust only:

Now know ye, that we, under and by virtue of the powers vested by the said Act, and by and with the advice of our Privy Council for Canada, do hereby proclaim and declare that all that part of the Ottawa River lying between the Chaudière Falls and Mackay's Bay, and all that part of the Gatineau River from the mill pond above Gilmour & Co.'s mill, at Chelsea, to the mouth of the said Gatineau River, shall, so far as regards sawdust only, be exempted from the operation of the said Act passed in the session of the Parliament of Canada held in the thirty-sixth year of our reign, chaptered sixty-five, and intituled: “An Act for the better protection of navigable streams and rivers.”

That is the last Proclamation that was issued.

By Honorable Mr. Olemov:—

Q. Have you got the previous one? A. I have not here, but I can send it over to you.

Q. What date was it? A. That was some years back.

Q. Did that apply to the sawdust merely, or did it include edgings? A. It applied merely to sawdust.

Q. Was this based on a report of your Department to the Government? A. No, it was based on a petition from the mill owners, if I recollect, that they be exempt from the operations of the Act.

Q. Did your Department ever cause an examination to be made with reference to it? A. No, not as a Departmental work.

Q. Not with reference to the fishing? A. Not that I am aware of.

By the Chairman:

Q. Is this the latest proclamation? A. This is the latest proclamation affecting the Ottawa—in fact the latest one we have. Perhaps I should mention that a question has arisen since that proclamation was issued, with reference to the Otonabee River. I was sent there by the Government two years ago, and after a very careful examination of the river—some complaints having been made with reference to the sawdust deposit—I examined it over a length of 30 or 40 miles with a good deal of care, and an arrangement was reached between those who were agitating for the entire protection of the river and the mill owners, but if the mill owners would

desist from throwing rubbish and edgings into the river, and allow only the sawdust that fell through the pitman hole, that they would stay their prosecutions. That arrangement has gone on in a measure satisfactorily up to the present spring. Now, the anti-sawdust association, as it is termed, of Peterboro', are again agitating in the direction of having the prohibition made entire. They say that even that exemption is having a serious effect on the navigation of the river, and claim that that arrangement should be terminated. That was only, I may explain, a Departmental arrangement. The Government had no power, under the Act, to make such an arrangement as that. They must either proclaim the river exempt, or it is amenable to the operation of the Act, and information may be laid by anyone who desires to complain.

By Honorable Mr. Botsford:

Q. What is your opinion with reference to the effect of the sawdust and edgings in the river that you did examine, with respect to the navigation. A. It does not admit of any doubt whatever. The continuous deposit of mill refuse can have but one result,—that it is injurious.

By Honorable Mr. Clemow:

Q. And with respect to the fish what effect has it? A. There is no doubt with respect to fishing. I am told that in years gone by, the Ottawa River was quite famous for its fish; of late years it is an industry that has fallen off almost entirely. That may be attributable to other causes as well as to the deposit of sawdust, but I should fancy that probably that is the principal reason. These bays and inlets which are the spawning grounds for the fish are filled up with mill refuse.

By the Chairman:

Q. Do you know anything in regard to the conditions of the Ottawa River? A. Yes, I have some idea of its condition in regard to the subject of the enquiry. I should think that the result will be somewhat serious to navigation if the practice is permitted to continue. Anyone traversing the river when the water is low cannot fail to be impressed with the fact that the deposits are seriously affecting navigation—I do not think that even the gentlemen who are running the mills will pretend to gainsay that.

Q. Can you speak of any particular points in the river where it is apparent? A. I have frequently, in going up and down the river, asked the question why the steamer slowed up at certain points, and was told it was on account of the river being so shallow from the deposit of sawdust and mill refuse; and I have also noticed when a steamer is going into the several wharves, especially in the upper part of the river, that she always stirs up a large amount of sawdust.

By Mr. Christie:

Q. Would not the effect of the bays being filled with sawdust, in a river with a current like that of the Ottawa, be to deepen the navigation by causing the channel to scour? A. I am not an expert in such matters.

Q. You know that the system of creating a channel in the river is to fill up the bays and shallows, and creating a swift current? A. I think the result of that would be, as the bays fill up, this debris would sink in the channel, and the channel would become narrower. It must find bottom somewhere, and if it is not sufficiently floatable when the water is low to carry it up to the shores, it must sink where it is.

Q. Have you never been down at Keefer's Bay, where the sawdust is in large quantities? A. Except in passing up and down the river I have not.

Q. You never noticed the channel where it comes in there? A. No, I have not.

Q. Do you know as a matter of fact that the navigation of all rivers changes as the country becomes cleared up; these freshets come down more suddenly, and the water becomes lower in midsummer than when the forests were in existence? A. I do not think it makes a difference in such a river as the Ottawa.

Q. That is to say, although the Ottawa is fed by numberless small streams, you do not think the clearing up of the forests on either side has any effect on the depth of the water? A. Not to any appreciable extent.

Q. And your opinion is upon that point that the clearing up of the country makes no difference as to the quantity of water in the Ottawa River during summer months? A. I should think very little difference.

Q. The Hudson is considered a celebrated fish river? A. They do take a great many fish in the Hudson, but I have not followed the question up. I know that in St. John Harbor this same question came up a great many years ago. It was plain that it was injuring the anchorage; that vessels would not hold their anchors in St. John Harbor in consequence of the sawdust, and a law was passed prohibiting the deposit of mill refuse in the harbor. I remember the St. John River a good many years ago, and I do not see any difference in it now, as far as the depth of water is concerned, from what it was when I first knew it.

Q. Your contention is that the destruction of the forests along those rivers does not affect the depth of water? A. No. Of course there are a great many more interval lands on St. John River than on the Ottawa. There is one point, with your permission, I will refer to. Speaking of the depreciation of fish in the Ottawa, it is quite possible that the dam at Carillon, which was improved in 1881, has done its share in lessening the numbers of the fish. Although it is a Government work and built at a cost of some \$385,000, there is no provision in it for fish to get up and of course in the summer season when fish are seeking their spawning ground their natural desire is to ascend the rivers, and provision should certainly be made to allow them to do so. Probably that has almost as much to do with the depreciation in the Ottawa fish as the sawdust.

Q. Supposing they did find their way up above the Carillon dam they would not spawn in the sawdust? A. No, they would certainly not come there to spawn.

JOHN STEWART called and examined.

By Honorable Mr. Olemow:

Q. What is your profession? A. I am a mining engineer.

Q. How long have you been in this section of the country? A. Three and a-half years.

Q. Are you conversant with the saw-dust question on the Ottawa? A. I understand a little about the uses to which it might be applied.

Q. Will you give the Committee the benefit of your knowledge of that subject? A. It might be utilized in a small way for the manufacture of paper pulp, and making compressed vessels—pails, tubs and vessels of that kind—and for making brick. It has been utilized for those purposes in Canada; but the large application, almost a Dominion one, as it applies to all the Provinces, it can be used for the manufacture of gas by treating it in proper furnaces, for the roasting and re-heating of iron. The heavy matter from the mills could be made into charcoal, and the products of distillation in the process of making the charcoal will pay for the carbonization of it. That could be used in glass furnaces. It has been done on a small scale. It has been experimented on and proved to be practicable, but not to any large extent as yet. It has been used in that way for the last 20 years in Sweden, and the Swedish association of iron merchants presented the inventor of those furnaces with the sum of \$10,000 for his ingenuity. The Michigan lumbermen utilize their sawdust in the manufacture of salt. They live in a salt region, and they bore wells and get salt springs, and evaporate the brine by burning the sawdust and converting the brine into salt.

Q. Do you know how Mr. Rathbun disposes of his sawdust? A. He uses it all in that way. He makes gas and lights the town of Deseronto, and he makes charcoal which he sells. There is nothing wasted from his mills.

Q. As an engineer, do you think this sawdust could be utilized profitably? A. I can see no difficulty in it, anymore than in the handling of the same number of tons of iron ore, not so much, because you can elevate the sawdust in elevators. You can convey it in a traveller, but you have got to shovel or handle iron ore. Even the

sawdust that is now in the river, some of it could be taken out and could be used in a furnace; because sawdust coming direct from the saw, from wet logs, containing 45 per cent. of water, can be utilized in that way. That was pointed out in the report of the Geological Survey by Dr. Sterry Hunt I think in 1870.

Q. Then in your opinion there is no practical difficulty in those sawmill men utilizing their sawdust and preventing it from going into the river? A. If they make sufficient arrangements for it, there is not.

By Honorable Mr. Smith:

Q. Did you ever see a sawmill driven by water-power from which the sawdust did not go into the river? A. I do not remember seeing it on the St. John River.

By the Chairman:

Q. Did you ever see it anywhere? A. Yes, the Miramichi sawmills burn their sawdust, but I cannot say that they are driven by water. It is not sufficient to destroy sawdust; the lumbermen ought to make use of it. It is putting it to a wrong use, even to burn it. They ought to make it into charcoal.

By Honorable Mr. Botsford:

Q. To make sawdust into charcoal. A. Yes.

Q. Would not that be an expensive process? A. They can do so. They can compress it into bricks in the same way as is done with fine coal dust. In Belgium and the north of France the coal is a poor lignite. It slacks itself or is slacked with water to wash out the sulphur, it is then dried and compressed in brick machines under strong pressure and formed into solid bricks. I have seen a piece of charcoal compressed from refuse cedar and pine at Deseronto, and to a person who did not know, it is like a piece of cast iron.

Q. Would not that be an expensive process? A. No. Senator Archibald can give the expense of that process. It would not be any more expensive than compressing coal dust which is done down in Cape Breton with the dust from the refuse of the coal mines of that part of the Province.

By Honorable Mr. Macdonald (B.C.):

Q. What do they mix with it? A. They take a little tar, but a better means of cementing it is the refuse from the starch factory. Instead of letting it go into the river, they use the refuse from a starch factory, one per cent. of which is sufficient to form a good bond mixed with charcoal.

Q. Would not earth do? A. A clay containing silica would not be desirable; it would need to be a clay containing lime, which would form a slag. The iron which would be manufactured in this way is just the same as the Swedish iron, the finest quality made in the market. If the market of Canada were not large enough—if we manufactured more than the market would take, we could export it, because the United States have to import that quality of iron from Sweden. In fact charcoal iron has been exported from the Province of Quebec in years past. I think, on a rough estimate, the amount of refuse from the mills here might be put down at something like thirty thousand tons of coal per annum.

By Honorable Mr. Botsford:

Q. Would not the process of making that refuse into coal be greater than the value of the coal after it was manufactured? A. No, it is not an expensive process, because it burns itself. The sawdust is fed from a large hopper, and falls down on a furnace bed, and that is passed off into gas into chambers; thence it passes off into a reservoir where it would be either brought to the furnaces for the roasting of ore or furnaces of re-heating iron. It is only in the expense of handling. Of course you have got to handle fuel of any kind if you are to roast ores or heat iron, so that the expense is not any greater than coal. Then in the manufacture of charcoal the products of distillation would pay for the expense of it, so that you would have the charcoal for nothing. One of the products is pyroligneous acid, and there are several other products, the result of distillation and carbonization. It is not iron ores alone to be roasted by that charcoal, the sulphur ores, the large deposits of which we have in this country can be very economically treated with the gas made from sawdust, because gas is a better roasting agent than fuel. That could be used for the manu-

facture of sulphuric acid for the treatment of our phosphates in the manufacture of superphosphate so that instead of shipping the crude apatite to England, we would manufacture it in this country and ship it in a manufactured state.

By Honorable Mr. Haythorne :

Q. And we could use it on our farms? A. Yes, and use it on our farms.

By Honorable Mr. Botsford :

Q. Do you reside in Ottawa? A. Yes.

Q. Have you seen the explosions which take place under the ice? A. I have seen them in the summer—small explosions, never any large ones—when I have been out boating.

By Honorable Mr. Clemow :

Q. You have been on the river often and seen the deposits of sawdust in the river? A. Yes.

Q. Have you seen deposits of any extent? A. Yes; I have seen large banks of sawdust.

Q. What is the effect of that on the navigation of the river? A. If it continues it will certainly obstruct navigation; the river will have to find a new channel. The bays are being filled up now and afterwards the channel will get filled up and the river will eat in on the banks.

Q. Have you observed the effect of the sawdust on the fish? A. It covers the spawning beds and it gets into the gills of the fish and of course they will not come up the river.

Q. Have you observed the effect of the decomposing sawdust on the health of the community? A. The gas that comes from it is much the same as the nasty marshy gas which comes from the swamps of ague malarial districts. It is produced from the same cause—the decomposition of vegetable matter.

Q. It is poisonous in its nature? A. It is, in excess. It is like carburetted hydrogen gas, and when it mixes with oxygen from the atmosphere it is explosive.

By Honorable Mr. Haythorne :

Q. You think this mill refuse can be removed by the proprietors of these mills without incurring any extra cost to them? A. To some it would involve more cost than others, but I cannot see any more difficulty in handling it than in handling the same amount of iron ore. I do not think that the majority of the lumbermen are against the utilization of it; the thing is to get them all harmonious—of one mind.

Q. Does it require united action? A. It requires united action to make it a success—to get them all to unite and have it utilized in the way I have referred to.

Q. Supposing they united, would the result be a profit to them or a loss? A. It would be a profit. If they will give all the waste from the mills, I can get a company to take hold of it—that is to say, as soon as they work their mills, if they will give all the product of their mills to a company.

By the Chairman :

Q. You mean in the way of sawdust? A. In the way of sawdust and slabs; if they will give all the waste from the mills, I can get a company that will take it away and use it.

By Mr. Christie :

Q. Have you not been some time engaged trying to get the lumbermen to go into a company? A. Yes, I have spoken to them.

Q. In that case, giving a company, you would be interested in getting the sawdust not put into the river of course; can you tell me any place on this continent where sawdust has been used for smelting iron? A. I said Rathbun had utilized it and had compressed it—charcoal has been made.

Q. I mean the sawdust? A. It does not matter whether you make charcoal from wood that has come from the sawmills or not, it is charcoal.

Q. Do you know any place in the world where sawdust has been used in smelting iron, directly or indirectly? A. I cannot say for sawdust—not in this country, but it has been used in Sweden.

Q. Will you tell me the places in Sweden where it has been used? A. It has been used all over Sweden.

Q. Tell me one place? A. Carlstadt and Monkfords.

Q. Tell me any one person that has ever used it? A. It has been used in London by the inventor of the furnace.

Q. Does he not smelt the iron from gas? A. He uses the sawdust to make gas to roast the iron ore and to re-heat it.

Q. Has it been used for smelting iron here at all? A. Gas has been tried in the United States. It is not impossible to do it, but it has never been done so far—not with natural gas.

Q. I mean gas from sawdust? A. Not in the blast furnace, but in the heating, roasting and re-heating of iron it is better than any other fuel.

Q. Can you tell me any place where sawdust of this quantity has ever been used at all for, say, a pulp mill? A. I can say that in Michigan it has been used to a very large extent for the boiling of brine.

Q. You mentioned a pulp mill? A. I said these were the small applications.

Q. I suppose the output of the mills at the Chaudière for one week would supply all the pulp used in Canada in a year; would it not supply all the paper required in Canada for ten years? A. I do not know the paper industry, but that is a small matter compared with the iron.

Q. You say that the sawdust produced each season at the Chaudière is equal to 30,000 tons of coal; can you give us an idea of what it would cost to convert that into charcoal—from actual experience I mean, not theory—can you tell us anything? A. It depends on the machinery. I think it costs two and a half cents a bushel.

Q. Do you know that from experience? A. Yes.

Q. Where is it done at two and a half cents a bushel? A. It has been done in Canada here.

Q. Where? A. In the Province of Quebec.

Q. At what place? A. For the Three Rivers furnace.

Q. In any quantity? A. In large quantities.

Q. What would you call a large quantity? A. Thousands of bushels—that is for the burners—the cost of manufacturing.

Q. What would be the cost of handling and manufacturing, say in Ottawa here—it would have to be removed a distance from the mills I suppose? A. That is a matter of detail that it is not necessary to go into.

Q. You could not tell the Committee what it would cost? A. I can tell them if they wish.

Q. But you do not know now what it would cost? A. I have not got all the figures, but I have the papers at home that will show it.

Q. To manufacture this sawdust for anything useful that you mention, would it not be necessary to convey it at least half a mile from the mill? A. In transporting it on a railway if you move it a few hundred feet it would not cost much more to move it a mile.

Q. How much would it cost to move it from the mills? A. When it is lifted by an elevator into a little car, and that is dumped into a bin which is higher than the railroad track, the bin doors open and the railroad car is filled. The car has a false bottom. The train comes along and takes the waste. The cars with false bottoms run over other bins at the smelting works, the bottom is opened and the refuse is dropped into another bin that will hold fifty or one hundred thousand tons. Then that is conveyed to the kilns or to the sawdust furnace by small cars. There is not any more difficulty—not as much as in handling iron ore.

Q. Can you tell me what would be the cost per ton of moving it a mile? A. Freight on the Intercolonial Railway and other railroads—

Q. I do not mean that; what would it cost per ton to move this material a mile? A. It is like any other freight, one cent a ton per mile.

Q. So you think the mill owners could move it from their mills at one cent a ton per mile? A. Yes.

Q. Moving it a mile you would estimate the rate the same as if it were carried 100 miles? A. Yes, that is the rate on the Intercolonial Railway.

Q. Do you think the railway would take it at that rate for that distance? A. I think so.

Q. But you could not give me an idea what it would cost per ton to manufacture this—the absolute cost? A. I do not think it is necessary to go into all the details of it here, because I would be giving away information that has cost me a great deal of time and labor to find out, and if I am giving it away to the public I am giving it to people who will not thank me for it.

Q. Then you are interested in having the sawdust utilised? A. Yes, deeply interested.

By Honorable Mr. Smith :

Q. Supposing this change was absolutely necessary, how long would it take, a year or more, to get all the necessary apparatus in working order? A. It would take one winter at least—this summer and one winter.

Q. Could it be all done in a year or 18 months? A. I should say it could.

By Mr. Christie :

Q. Would it require any alteration in the mills? A. It might take a little longer, because you have got to erect your furnaces and smelting works.

Q. That only could be done in summer? A. It would take perhaps two years before it could be all in operation.

Q. Would it require any change in the mills at the Chaudière? A. Yes, some more and some less.

Q. But it would require some change in all of them? A. No, not all; it would not require to change the mills, but it would be necessary to put in additional machinery.

Q. Do you know any experience that has been had in roasting iron ore with sawdust at the Gilmour mills? A. That was a family matter which was mismanaged.

Q. But it was tried was it not? A. Yes.

Q. Was it a failure? A. That has nothing to do with the matter, it has been successful in the United States and other countries where it has been tried.

Q. As a matter of fact was it not a failure when it was tried here? A. That has nothing to do with the case in point.

Q. Do you know as a fact that it resulted in a failure there? A. I know that some lumbermen have failed in business, but the gentlemen who are conducting the business here now are not failing.

By Honorable Mr. Haythorne :

Q. You say the supply of mill refuse is greater than would be required for paper making? A. Yes.

Q. Is it not a fact that pulp is used for a great many purposes besides making paper? A. Yes.

Q. And that these purposes are increasing day by day and year by year? A. Yes, but the use of it that way is so small compared with the quantity that would be required for roasting and heating ores and smelting that it is hardly worth taking into account. It is a very small industry.

HON. MR. DEVER called and examined.

By Honorable Mr. Olemow :

Q. Have you had any experience in sawdust and mill refuse on the river St. John? A. I found at the harbor of St. John and on the river also that numerous miles of the same description that you have at the Chaudière here were in the habit of throwing their sawdust and other refuse into the river and harbor. The practice was so injurious to the waters of our harbor, destroying the fish and creating shoals in the harbor that we deemed it necessary to prevent it and we did prevent it.

By the Chairman :

Q. How? A. By law.

Q. You prohibited the throwing of sawdust into the river? A. Yes and the fact is now that the mills consume their sawdust. It is not our business to say how they shall dispose of it, but we say they shall not throw it into the river. They have also to dispose of their slabs and bark and refuse of all kinds. They build that in piles and set it on fire and in that way we are completely relieved of this trouble.

By Honorable Mr. Smith :

Q. Were those mills run by steam or by water? A. Some by steam and some by water. In fact it is an offence to throw mill refuse into the river.

Q. But it was not so always? A. In our primitive state it was not considered necessary to prevent it, but we were compelled to do so because our harbors and fish pools would have been filled up with this decomposing vegetable matter. It became ruinous to the fish, destroying their spawning grounds and lessening the supply of fish generally.

By Honorable Mr. Botsford :

Q. When saw mills are run by water what contrivance have they for preventing it from falling into the river? A. They cart it away and burn it.

Q. But how do they prevent the sawdust from falling into the water in the saw-mills which are run by water power? A. The floor is completely covered over and the sawdust is raked out. It is taken away in carts constructed for that purpose—large wheeled carts.

Q. There is no sawdust thrown into the water at all then? A. If there is, they do it clandestinely. They cannot do it publicly now. It is a mere matter of arrangement with those mills I allege. It will be some expense I admit to change the mills here, but it is part of their business to make such arrangements and not impose on the public I think.

By Mr. Christie :

Q. Would you name any mill which is run by water on the St. John River that does not allow the sawdust to drop into the river? A. None of the mills do.

Q. Can you name any water mills? A. There are not many water mills because they are almost all run by steam now. They simply cart away the mill refuse and burn it in heaps.

Q. In the harbor at St. John there is no current I believe? A. Yea, there is quite a current. The tide rises 40 feet.

F. P. BRONSON, called and examined.

By Mr. Christie :

Q. You are one of the mill owners here I understand? A. I am employed by Bronson & Weston.

Q. Did you lately make an examination of the place where it was reported the steamer "Peerless" had grounded? A. I did at the time the passenger boat went ashore on the Kettle Island.

Q. When was that? A. Two years ago.

Q. You made a thorough examination at the time? A. Yes.

Q. What did you find there? A. I found nothing but sand, with here and there a lonesome looking piece of sawdust.

Q. Do you know the channel of the river at all? A. Yes, I know it at that point.

Q. How long have you known it there? A. Since that time more especially.

Q. How is the channel there? A. I do not know the depth of the channel, but it is free from sawdust at the point where we made the examination—I should judge it would be about 200 feet out in the channel. The Peerless went ashore on a very foggy day, and when we went down to examine it I took the steamer "Otter" that towed the Peerless off the bank and told the Captain to take me to the exact spot where she went ashore, and he pointed out the place where he said she had grounded. I took a long handled scoop shovel and pike pole, but my shovel was hardly long

enough to take up any sample of sand. The captain in getting as near to the shore as possible to enable me to make this investigation got his own tug on to the bank and in endeavoring to get off for about 15 minutes he turned up any quantity of clear sand—so much of it and so long were we there in trying to get off that his steam ran out, and in order to replenish the boilers they took in a little more water and the result was when we did get off we had to run across to Hillman's mills and snub to a boat there and the engineer was obliged to take his pump apart and get out the sand—not sawdust, but sand.

By Honorable Mr. Botsford :

Q. Did you examine it minutely yourself? A. I did not examine it minutely myself, but I asked the engineer what it was and he said it was sand.

Q. There might be sawdust too? A. If there had been sawdust he would have told me. My own eyes were my evidence that it was not sawdust, but almost wholly sand.

CAPTAIN BOWIE—The Peerless was never aground.

THE WITNESS—I said a passenger boat.

By Honorable Mr. Clemon :

Is that all you know about the river? A. I have never made any other examination of the river except down near the lighthouse in passing there with a small steam yacht. Not knowing the channel at that time at that point I would have been very glad if there had been a bed of sawdust instead of rock to take the force of the blow.

Q. How long have you been in the city? A. All my life—since 1853.

Q. Were the saw mills erected then? A. Yes.

Q. You did not know the river before the mills were erected? A. No, I was too young.

Q. So there is no sawdust at all in the river now? A. There is sawdust, certainly, but I have never found in the channel any sawdust.

Q. You have never been at any other points of the river, I understand? A. Yes, I have been up and down the river some, but I never made any personal examination of the river. At the point where the passenger boat went aground the current is so slight as compared with the proper channel of the river that if there had been any deposit in the channel it would be at that point, and as there was none there, the inference is there would be none in the channel of the river.

E. H. BRONSON, M.P.P., called and examined.

By Mr. Christie :

Q. You are a member of the firm of Bronsons & Weston? A. I am.

Q. You have had considerable experience in the working of saw mills, I suppose?
A. Yes.

Q. For how long? A. About 20 years.

Q. Have you ever heard of a sawmill that was so constructed that the sawdust did not fall into the river? A. Never.

Q. Have you examined water sawmills, not only in Canada but in the United States? A. I have on the Hudson River, New York State.

Q. Do you know if there are any water mills in Maine or any place at all in the United States which are so constructed that the sawdust cannot drop into the river? A. No, I do not. I am not much acquainted with the sawmills in Maine.

Q. Will you tell the Committee what you know of the effect of sawdust on the channel of a river? A. I know there is some sawdust in the river, no lumberman denies that. Some years ago we were allowed to put everything into the river, slabs, edgings and all kinds of mill refuse, and bars were formed by these slabs and edgings. At the instance of the Government, arrangements were made in our mills by which these were either entirely kept out or run through the hogging machine and cut into chips so as to admit of easy dredging. So far as sawdust is concerned

the navigable channel, as far as I am aware, is not impeded in any way by the deposits of sawdust. In 1871 a very careful report was made on an examination of the Hudson River, as furnishing a case in point where lumbering operations had been carried on for about 100 years and all kinds of mill refuse freely thrown into the stream. An examination was made with a view to ascertain the effect on the Hudson, presuming it would be the same on the Ottawa, this being a somewhat similar stream. The result of the investigation was that no obstruction to navigation had occurred through the mill refuse, and the engineers who conducted the investigation demonstrated that a current running one-fifth of a mile per hour was sufficient to remove saturated sawdust, which is only very little heavier than water, out of the channel, and the absolute correctness of that theory has been, I think, clearly proven by the success of Captain Eads in deepening the outlet of the Mississippi, simply by confining the channel and scouring the mud and sand brought down by the river from the channel. Of course if sand can be removed in that way (which has double the specific gravity of saturated sawdust) a current running at about the velocity stated by these engineers would be sufficient to remove the sawdust from the channel.

By the Chairman :

Q. Are the mills on the Hudson River that you speak of above or below tidal water? A. They are above tidal water—above Troy and Albany.

By Honorable Mr. Smith :

Q. Does the sawdust go in at Troy? A. No, higher up, at Fort Edwards, about 40 miles above Troy.

By Mr. Christie :

Q. Is the lumber trade here more largely interested in the navigation of the Ottawa River than any other interest? A. Certainly, for the reason that our products find a market almost exclusively by water transportation.

Q. What proportion does the lumber trade hold, compared with all other interests combined? A. I suppose our mills have a capacity of about 300,000,000 of feet, and of that 80 per cent. or say 250,000,000 feet would find a market by water transportation.

Q. I mean in the proportion of vessels navigating the river? What would be the proportion of all other interests as compared with the lumber interest? A. I should say the lumber interest would employ 90 per cent.

Q. Have you ever known any injury to the navigation by mill refuse as far as the lumbermen's interests are concerned? A. No, the vessels which take our lumber are carrying much larger loads to-day than they did 15 years ago. I have seen boats go out with 50,000 feet; now they carry 250,000 feet.

Q. So they carry two or three times as much as they used to? A. In some instances five times as much.

Q. Have you ever heard any complaint made by persons carrying lumber that the navigation was injured? A. No.

By Honorable Mr. Macdonald :

Q. Have you not had barges grounded at the foot of the canal? A. Yes, barges have grounded on the sawdust there?

Q. You are interested in the navigation of the canal too? A. Yes.

Q. For the last two years? A. Yes.

Q. What proportion of traffic is your traffic with all the rest that enters the canal there? A. I do not know. The records of the Canal Department would show that. We have four lockages a day.

Q. Taking up big loads? A. Yes.

Q. Does it interfere with your navigation there? A. It did somewhat last fall, because the water was exceptionally low.

Q. How did last season compare with other seasons, so far as your experience is concerned? A. I do not remember ever seeing the water so low as it was last year.

Q. The clearing away of the forest would make a difference in the height of the water? A. The theory is that the water runs off more quickly and produces higher water in the spring and lower water in the summer.

Q. Do you know any means by which you could compare the depth of the water now with what it was 30 years ago and attribute it to any particular cause? Are there not a great many other causes than the sawdust? A. I think the sand that is brought down by some of the tributaries, largely by the Gatineau and Blanche has had more to do with the injury to navigation below Ottawa than the sawdust. All our examinations tend to confirm that idea.

By the Chairman:

Q. Have you made any personal examinations? A. None, except at the Blanche. I have been on board the boats that have grounded there, but on examining the bottom we have found it all sand.

Q. Do you know any boats that grounded on sawdust alone? A. No.

Q. Now as to the question of changing the mills: would you give some idea of the quantity of lumber manufactured on the Hudson and on the Ottawa Rivers? A. It has reached I think as high as 300,000,000 feet a year on the Hudson.

Q. And on the Ottawa about how much? A. I suppose on the whole of the Ottawa above Grenville there is a sawing capacity of about 600,000,000. Of course that includes steam as well as water mills.

Q. Now as to the changing of mills to prevent the sawdust falling, in what change would be necessary here? A. As our mills are constructed we would have almost practically to rebuild them to enable us to remove the greater part of this refuse. I do not think we could in a water mill remove the whole of it, but to remove the bulk of it we would practically have to reconstruct our mills.

Q. If you were going to reconstruct a mill, did it ever enter into your calculations what you would do? A. The only advantage which we enjoy at Ottawa is in the use of the water-power. Apart from that every other consideration is against the manufactures of lumber at Ottawa. We labor under a very serious disadvantage, not having sufficient room to dispose of our lumber and in many other ways, so that the only reason the mills are located here is because of the water-power. Since these mills were built steam has been so greatly improved that it is just a question if it is not more economical to manufacture by steam than by water, and if we were debarred from the use of the water-power here there would be no object in our continuing to manufacture in Ottawa city.

Q. And if there was any stringent law passed against allowing the river to carry away this sawdust, what would be the result of that on the milling interest in Ottawa? A. I think the result would be that it would cause us to rebuild our mills and in doing that we would naturally locate where we would have the best advantages we could secure. For instance it is a fact that lumber can be driven much cheaper in the log than it can be freighted in boats, and in locating a mill advantageously the prime object would be to locate as near the market as possible. Now the freights on lumber from Montreal to New York are from a dollar to a dollar and a quarter less than from Ottawa, and our experience in driving the Ottawa above here convinces us that by extending the same improvement below Ottawa that we have above, we could drive the river from here to Montreal for about twenty-five cents a thousand. I have gone into the calculation somewhat closely, so there would be a saving of twenty-five cents to the dollar in freight if our mills were located further down stream. There is another advantage; near a large city like Montreal we would have a large market for our refuse, and on the Hudson I know as a fact the value of the refuse is sufficient to pay the whole cost of manufacturing.

Q. If you had to reconstruct all your mills, it would be more advantageous to you to build them up again near some place like Montreal? A. Most decidedly.

Q. As a matter of fact have not the lumbermen at the Chaudière taken that into consideration the last few years? A. We have often discussed that.

Q. The practical effect would be that it would be more advantageous for you to remove all your milling establishments to Montreal if the law were passed preventing the throwing of mill refuse into the river? A. It would be more advantageous for us.

Q. You heard Mr. Stewart giving evidence as to the applicability of sawdust for useful purposes. Have you ever given that subject consideration? A. We have considered the advisability of establishing works for the manufacture of paper pulp, not from sawdust, but from the larger mill refuse.

Q. Could you manufacture pulp from sawdust—do you know of any mode by which it could be done? A. It might be manufactured, but the sawdust is so small that the grain is too short and it would not give the product sufficient tenacity to make it valuable.

Q. Have you ever considered the small quantity of sawdust that would be used for pulp? A. No, we never considered the propriety or advisability of using sawdust in pulp—it was all larger mill refuse.

Q. As to burning sawdust, have you ever considered the effect of burning such a large quantity in a city like Ottawa, or could it be done? A. Yes, we have considered that, and so far as we could determine the construction of furnaces for the burning of this sawdust, even if it were possible to save it, it would very greatly enhance our fire risk. Our mills are so closely placed and we have so very little room for the piling of lumber that in a very dry season it would be a difficult matter to locate these burners a sufficient distance from the lumber.

Q. In placing a burner for each mill, would it not make it as hazardous as a steam saw mill? A. I should say equally so.

Q. Tell us the difference in the risk between steam and water? A. I think they charge from 6 to 10 per cent. on steam mills, and we pay two and a half per cent. on our water mills.

Q. So that the question of burning sawdust in the neighborhood of your mills would make that difference in the insurance alone. Now the mere cost of moving the sawdust—how much would that be—have you ever considered that? A. I think Mr. Mather made a calculation in 1878 when he examined the mills, and I think he estimated that it would cost about fifteen cents a thousand feet to remove the sawdust and refuse from the mill to the burner.

Q. Could you give an idea how much the removal of that would amount to a day in mills like yours? A. It would amount to \$50 or \$60 a day.

Q. How much do you saw a day? A. From 350,000 to 400,000 feet.

Q. Does your mill saw as much as the others? A. There is not a great deal of difference between the output of our mills and of the others.

Q. How many mills would there be representing that much per day? A. There are four mills on the Ottawa side of the river and three mills on the Hull side.

Q. Would all those mills represent \$600 a day for the removal of the sawdust? A. Not on that basis, because there are not ten mills.

Q. How much in your judgment would it amount to? A. There are seven mills.

By the Chairman :

Q. How many days would your mills be in operation in the season? A. We usually run from 150 to 180 days.

Q. Then you think it would cost \$10,800 a year? A. That is on the basis of Mr. Mather's estimate. We know that in practice work is not done as cheaply as a rule as it is estimated when we come to practice it.

Q. Supposing you were sawing logs for other people, how much could you earn in that time? A. There is very little to be earned in sawing logs for other people. We could not earn \$10,000 if we ran our mills that way.

Q. Do you know of any lumbermen in the neighborhood here who put up a burner, and do you know the effect it had on the insurance? A. I think the Messrs. Gilmour put up a burner, at their Hull mill, which they afterwards discontinued.

Q. Do you know the reason why? A. I think it was because of its proximity to the lumber and the increased fire risk.

Q. Do you know that? A. I understood from Mr. Gilmour that that was the reason.

Q. They had to stop it at any rate? A. Yes.

By Honorable Mr. Olemow :

Q. As I understand you your information extends to the period since the erection of mills at the Chaudière? A. I have been actively connected with the business for twenty years.

Q. You were not here prior to the erection of those mills? A. No.

Q. You know nothing about the river in its primitive state? A. No.

Q. So all your information is with reference to the river during the last twenty years? A. Yes.

Q. Have you heard the evidence of Mr. Gray and other experts who have examined the river? A. I have not.

Q. What is the amount of production of the mills at the Chaudière? A. Just at the Chaudière I suppose we have a capacity of 250,000,000 feet.

Q. I understood you to say 300,000,000? A. I included in that estimate the New Edinburgh mills.

Q. What proportion of the sawdust and refuse go into the river according to your calculation? A. There is practically nothing thrown into the river from our mills except the sawdust and a very small quantity of chips from the grinder.

Q. No slabs? A. No, the slabs and edgings are all kept out. Those of them that are fit are cut into smaller articles—laths, pickets, &c.—and carted away for wood. It is only small chips the size of your hand that are valueless for wood that are passed into these grinders and cut into chips.

Q. Can you give us the proportion of the sawdust and the material from the grinders? A. The proportion from the grinders is very small.

Q. Can you give us an idea of the proportion? A. I do not suppose the output of the grinders to be ten per cent. of the amount of sawdust.

Q. What is the amount of sawdust that comes from your mill? A. I never made any calculation.

Q. Give us an idea? A. Our saw cut is, say, about one-eighth of an inch. I suppose ten per cent. of the material in the log is cut into sawdust in cutting it up.

Q. That all goes into the river? A. Yes, practically.

Q. You think this sawdust and refuse, whatever it is, has no damaging affect on the river? A. Not on the navigation of the river, for the reason it is so near the specific gravity of water that a very slight current; estimated by McAlpine at one-fifth or one-sixth of a mile an hour is sufficient to remove it.

Q. Are you an expert? A. No.

Q. Then these experts who have examined the river must be inaccurate according to your version of it? A. I do not say that.

Q. Either one or the other must be right? A. There is this fact to be borne in mind, that deposits that are formed during the low water in the fall of the year, when those examinations are usually made, are often removed by the high water of the following spring.

Q. How do you know that? A. From this fact: two or three years ago there was a very large reef at the foot of Pine Tree Island, and a year ago last spring that reef, which I think was the largest deposit of mill refuse on the Ottawa, so far as I know, was almost entirely removed by the action of the spring freshet.

Q. Do you know that personally? A. I know that for a fact, because at that season of the year, though the water was not so low as usual, it was plainly visible, while last year when the water was lower than it had ever been before in my recollection, there was no part of it to be seen.

Q. Does sawdust sink? A. Yes.

Q. Have you taken steps to ascertain whether that reef has sunk or been removed by the current? A. No. I simply state this fact in support of my contention that a strong current will remove these deposits. That is a case in point which I know as a fact.

Q. You calculate the expense of removing the sawdust—everything we call refuse that would obstruct the river at \$10,000 a year? A. No, I have made no calculation at all. I simply stated that was Mr. Mather's calculation so far as the mills

at the Chaudière are concerned. I think, however, the estimate is far below the mark, because we would practically have to re-build our mills in order to carry out this change.

Q. Suppose it did cost \$10,000 a year and you could utilize this material would there be any difficulty in accomplishing that for the benefit of the whole country? A. I think if we were convinced that this material could be profitably utilized, as a previous witness has said it could be, we would be very glad as far as possible to utilize it, but it remains to be seen whether such is the case or not. I think it would be very easy to overstock the market with charcoal. There is a very limited demand for it in Ottawa.

J. R. BOOTH called and examined.

By Mr. Christie :

Q. You are one of the mill owners at the Chaudière? A. Yes.

Q. And you know the Ottawa River for the last 20 years? A. Yes, I know it for the last 35 years.

Q. Have you ever had steamboats of your own on the Ottawa River? A. Yes, six or seven years ago I had four steamboats and a fleet of 25 or 30 barges.

Q. Will you give us your views as to the effect on the navigation of the river of the sawdust and mill refuse that has been thrown into it? A. I ran those steamboats and barges for 16 years, and I never heard one of my captains or engineers make any complaint about sawdust in the stream.

By the Chairman :

Q. Up to what time was that? A. I ran those boats up to 6 years ago.

By Mr. Christie :

Q. Was the capacity of those boats and barges large? A. Yes.

Q. Larger than it was 25 or 30 years ago? A. Yes. I was one of the parties who did away with the large fleet of small barges I had and built large ones. Murphy & Co., built some the same year.

Q. Those barges have a capacity four or five times as large as the old barges? A. Yes, because the old ones used to carry only from 60 to 80 thousand feet.

Q. What percentage of the navigation of the river is outside of the lumber interests? Do you agree with the statement that Mr. Bronson gives? A. I should say that the lumbermen employ 95 per cent. of the navigation of the Ottawa River.

Q. Have you ever heard from any captain or engineer employed by the steamboats complaints of the navigation of the Ottawa? A. No.

Q. Are there not a large number of barges coming from the United States—foreign vessels? A. Yes.

Q. And the lumbermen are not interested in those barges at all? A. No.

Q. Did you ever hear any of those foreigners complain of the navigation of the Ottawa? A. Never.

Q. Have they large barges also? A. Yes, they have fully as large barges as we have.

Q. As to the fish that they say have been destroyed in the Ottawa, what do you know about that? A. I have been here for 25 or 26 years, and I never knew of there being many fish in the Ottawa. I know they catch a good many fish in the Remiques and other rapids above the Chaudière; but I do not know of many fish being caught above the Des Chênes.

Q. Or below the Chaudière? A. Or below the Chaudière.

Q. Did you ever hear of or know of a watermill in which there was any contrivance to prevent the sawdust from falling into the river? A. I do not think it is possible to build a watermill that way. If a man was obliged to keep out the sawdust out of the river it would be much cheaper for him to build a steam mill.

Q. Would you let the Committee know what difference it would make in changing the form of your mill to keep sawdust out of the river? A. It would be

virtually building a new mill. The saws are now run direct from the wheel in the water, and the whole construction of the mill is below the level of the ground—below the platform where we drive out. In order to make it so as to keep the sawdust out, we would have to raise the mill a storey so as to get under it to cart out the sawdust. That would necessitate a change from the direct action of the crank to a belt mill, which would be virtually the same as the steam mill.

Q. What would it cost to change a mill like yours in that way? A. I would just as soon build a new mill. It would cost \$150,000 to \$200,000.

Q. In constructing a new mill, would it enter your calculations at all, whether you could remove from Ottawa to another place more economically than to rebuild here? A. We have heard so much about the sawdust question for a number of years, that we have several times, when we have met as a lumber company, discussed this question very seriously, and we have often come to the conclusion that if we were obliged to keep the sawdust out of the river, it would be cheaper for us to move our mills to somewhere in the vicinity of the St. Lawrence, and drive our logs there, the same as we did above, to where we can get plenty of piling ground, and easy shipping. The saving of freight, to a mill of the capacity of mine, would not be less than \$60,000 a year—the saving of freight alone from here to the St. Lawrence somewhere back of Montreal. Then that is not the only advantage. There would be a great advantage in having a market for the refuse wood, that we get nothing for now. It is a burden to us to get rid of it. We would also have a greater advantage than that—we would handle our lumber much easier. We could locate a steam mill where we would have plenty of piling ground. To give you an idea of what it costs to take care of the lumber from my mill, I run 180 waggons, and have 150 span of horses to take the lumber away from the mill. I draw it from $\frac{3}{4}$ of a mile to $1\frac{1}{2}$ miles; and if we were running a steam mill, we could draw it all out with one steam engine, run perhaps with 14 or 15 men. These are some of the advantages we would have by taking our mills to where we would get plenty of piling ground.

Q. Now, assuming that any stringent law was made by which you would have to change all your mills, could you give us an idea how much of a direct loss that would be to the seven mill owners at the Chaudière, considering the improvements you would have to make? A. I do not think that all the mills could be changed over to belt mills under 750 thousand to one million of dollars. It would be virtually building new mills, because you could not raise the old ones. If we were going to build new mills to keep the sawdust out, I would take mine down altogether and build a new one in its place—that is if we were going to run it by water; but if we were obliged to change our present system, I would not build it there at all, because the advantages in moving it are so great that there would be no inducement for me to continue sawing with a water mill. I contend that we are manufacturing here in the most expensive place between Ottawa and Quebec. There is only one advantage in manufacturing here, and that is, we have a water power, and that not reliable, because it is very unsteady. We have it very high in the spring and very low in the summer time. Sometimes in midsummer we do not run more than half the mill, whereas with steam power, every day is the same steady power.

Q. Did you ever consider the effect it would have on insurance if you had to build furnaces to consume your sawdust? A. We have discussed that question very often, and we have come to the conclusion that it would be utterly impossible to construct anything that would make it any way safe to burn sawdust at the Chaudière. The ground is so limited that there would be no way of doing it except by putting it alongside of the mill, which would endanger the mill and the lumber piled in the vicinity. We have never come to any conclusion that we could dispose of the sawdust by burning it.

Q. Would it not be practically making all those mills as risky as steam saw-mills by burning this stuff close to them? A. Practically it would.

Q. Would it not raise the insurance on your saw-mills to the same rate as on steam mills? A. I believe so.

Q. Presuming that all those mills were changed to steam saw-mills, with all those millions of feet of lumber piled at the Chaudière, would it not practically endanger the whole city? A. I think it would be a very serious thing for this city and the lumbermen and all concerned if we were to undertake to burn all the sawdust made in those mills anywhere within a mile of the Chaudière.

Q. If all those water-mills over there were changed, as they would be changed into steam saw mills, if the sawdust has to be kept out of the river, would it not be a very serious injury to the whole of the city? A. To show you how dangerous it would be, Mr. Rochester had a steam mill right close to my lumberyard and another a little further off; and I do not believe that there was a summer that he ran that mill but what my lumberyard was on fire from 10 to 50 times in the course of the summer, and his own lumberyard was also on fire several times. He burned his sawdust, which would be precisely the same thing with us if we had to consume our sawdust, and all the surroundings are so dry, that the sawdust, with the great draft that would have to be used in the furnaces would be carried up in a live state to the smoke stack, and wherever it falls when the ground is dry, it is sure to ignite. It is a well known fact throughout the city that the running of those two steam mills had frequently set fire to the lumber, and I know for my part I was glad when they were shut down. One of them has recently started again as a box factory, and the yard has already been on fire twice this season.

Q. Can you give us some idea of what the life of a steam sawmill is—with respect to its risk of being burned down? Has not every steam mill in the vicinity of Ottawa been burned at least once and some of them oftener? A. I think Gilmour's was burned twice, and Edwards was burned once. I know that the first mill that the Gilmours built here they went to a tremendous expense to protect it from fire, yet it was burned down, not only once, but a second time.

Q. From your experience of those steam saw mills do you consider that the construction of large furnaces for consuming the sawdust would endanger the whole city? A. I cannot see any difference between a burner to burn sawdust and the running of a steam saw mill.

Q. Would not seven burners in a narrow space at the Chaudière endanger the whole property of the city of Ottawa? A. I am very sure that the lumbermen here would never run mills at the Chaudière and undertake to burn their sawdust.

Q. Could you give us an idea of how much lumber there is piled around those mills, confined in a small space? A. There is hardly a time that there is less than 250,000,000 feet of lumber in the city here.

Q. And if one of those large mills, run with steam power, were to get on fire, would it not endanger the whole of that lumber, being burned? A. Certainly it would. It is piled in such a contracted place.

Q. And the burning of all that lumber in the neighborhood of those mills, what in your judgment would be the effect of it on the city? A. I think the most prejudiced man in the world against sawdust would say that the whole city would be in danger. I do not think it possible to have a large fire in any one of those lumber yards, where there are 40 or 50 piles of lumber on fire at one time, and save the city.

By the Chairman :

Q. Do you think these buildings would be safe? A. I do not think it. They would be pretty hot at any rate. We have had several fires at the Chaudière, but we have always managed to confine it to one or two piles.

By Mr. Christie :

Q. Have you ever examined any reef on the Ottawa River which the captain of the "Peerless" said was sawdust? A. No, I never did. Once when I was going down with Capt. Bowie on the steamboat, a number of years ago, when near Grenville we happened to be on deck with some other gentlemen, and he pointed out a large bank of sawdust to me in the way of chaffing me about the sawmill men throwing sawdust into the river. We got up quite an argument about it. I told him it was not sawdust but sand. He contended it was sawdust, and I was quite sure it was not sawdust, because I had never seen any down that far, and knew it

would not float down that far. When Mr. Goodwin was doing the work at Grenville in the locks, shortly after that, he took his supply of sand out of that very bank, and it was beautiful clear sand as you ever saw.

Q. Do you know anything at all about Pine Tree Island here? A. No, I do not.

Q. Would it be possible for the Committee to see that reef at any time now? A. Certainly.

Q. Do you know what would be the effect of sawdust in the channel of the river where the current is as rapid as here, if the bays were filled up altogether? A. I do not think it is possible for sawdust to stop in the channel of the river where sand would be driven and form great shoals clear across the river. I think it is a very easy matter to solve. I know that on the Hull side of the river, where I have my shipping ground and do all my shipping, in high water, the sawdust from Hurdman & Co.'s and Eddy's mills comes out there and forms great shoals in low water along the front of my dock, so that when the water goes down, along in July, I have to abandon that dock on account of the mill refuse. Then when we commence to ship there in the spring again, we find that the high water has driven the sawdust out clean to the rocks. Then just as soon as the water gets low again in the fall the sawdust accumulates and is driven out again in the following spring by the high water. I do not know any better place on the river to thoroughly illustrate the effect of the current on those sawdust banks than at that dock.

Q. Could you give us an idea how much it would cost per day to remove the sawdust from your mills? A. I do not think I could keep it out of my mills even if I had a place to dump it at a cost of less than one hundred dollars a day.

Q. Could you tell me whether you have made any enquiries or examination into the modes of utilizing sawdust? A. I have not. I have heard a great many talk about making paper pulp from sawdust, but I have heard others say that they would rather pay five or six dollars a cord for wood than make it from sawdust if they got it for nothing. Even with sawdust supplied for nothing they require a certain amount of other material to mix with it to make pulp.

By the Honorable Mr. Clemon:

Q. You were here before the mills were erected? A. Yes.

Q. Do you know the state of the river at that time? A. The state of the river then was like all other rivers—the bays were perfectly clear of sawdust.

Q. What quantity of stuff do you cut every season in your mills? A. I cut over 60 million feet.

Q. What proportion of that goes into the river—the sawdust and slabs and edgings, or do you throw any of your edgings into the river? A. No edgings go in whole. There are small pieces off the ends of the stuff we make into laths, that go through the edging grinder,—anything that is too small to take out for lath wood.

Q. Could you give us an idea of the proportion of sawdust, and also the proportion of the other refuse that goes into the river from your mill per annum? A. I should say that the quantity of other material besides sawdust that goes in is perhaps three or four per cent. of the quantity of sawdust. We keep out everything we possibly can get carted off.

Q. You say that your boats in late years carry greater cargoes than in former years. Is that attributable to an increased depth in the channel, or is it attributable to the improvements made at Ste. Anne and other places? A. It is attributable to a larger class of boats used.

Q. Owing to the improvements at Ste. Anne's? A. I do not think it is attributable to the improvements at Ste. Anne's, but to a larger class of boats.

Q. Do you think the river is now able to accommodate a larger class of boats than in former days? A. I do not think so. I know that the water gets as low below the Chaudière Falls now as it did at any time 20 years ago.

Q. You have heard the evidence of experts as to the filling in of those bays and the detrimental effect it is having on navigation? A. No, I do not concur in that that the sawdust is interfering with navigation.

By Honorable Mr. Macdonald (B.C.):

Q. Are you aware that it is filling up some of the bays along the river? A. Yes.

Q. And injuring property along the river? A. It may injure property to a certain extent. If a man has a property opposite one of those bays, and wants to go out with a pleasure boat, it may effect it in that way, but that is confined to a very few places. I think there is no place on the north side of the river affected in that way. There is at the foot of the locks and McKay's Bay and other places down below Gatineau Point affected in that way I know, but they are the only places.

By Honorable Mr. Clemon:

Q. Do you know how they dispose of their mill refuse at McLaughlin's mill, Arnprior? A. They put it in the water there.

Q. Do they not burn it? A. No, all the sawdust and refuse that is made in the five gang mill of McLaughlin's mill was all put into the water.

Q. How do they dispose of the sawdust at Edward's mill? A. They burn it.

Q. Is that a steam mill? A. Yes.

Q. They burn it as well as run their engine with it? A. Yes, but they are differently situated from what we are here. He has room to run his lumber a long way out from the mill. It can be done if you have space to do it in.

By Honorable Mr. Macdonald (B.C.):

Q. If the Government neglected to keep the mouth of the canal open by dredging, how would you whip your lumber up the canal? A. We would do I think as has often been done before. We would put in a side wheel steamer, hitch it to the lock and set the wheels going and it would move out the sawdust. That has been done several years.

Q. Was that done by yourself or by the Government? A. The Government have done it and parties going up the canal have done it. You would be surprised to see what a short time a boat getting into a pile of sawdust will dispose of it by setting the side wheels going.

Q. But if there are slabs in it they cannot touch it? A. Slabs are a serious thing for navigation of course.

By Mr. Christie:

Q. The slabs have not been thrown in the river for the last ten years? A. No.

By Honorable Mr. Clemon:

Q. They seem to say that the stuff from the hog is a very serious obstruction to navigation? A. There is a very little of it. I know that on the north side where our deck is there are immense quantities of it coming in there, but it is moved off by the high water the same as the sawdust is.

Q. You seem to anticipate a great deal of danger from these burners being erected for burning the sawdust; could they not be constructed so as to provide against danger of that kind? A. I do not know of any way to do it. You have got to have a vent for draft, and when you have a hot fire the draft is so great that the sawdust is drawn up in a live state and it must come out at the top. When it is drawn up in that way it must fall again outside and will set fire to anything dry on the ground.

By Honorable Mr. Macdonald (B.C.):

Q. Can you not cover the top of the smoke-stack with wire netting? A. That has been tried, but the wire netting fills up with the burning sawdust and stops the draught. That is the greatest difficulty that is found in running steam mills with sawdust.

HONORABLE MR. MACDONALD.—I have seen a steam mill in Victoria that has been running for five years with a cap over the top of the smoke stack, and no fire has ever occurred from it.

By Mr. Christie:

Q. Has any person ever made any complaint to the mill owners about sawdust accumulating in the bays except Mr. Ratté? A. No.

By Honorable Mr. Scott :

Q. Might not all the material except the sawdust be kept out of the water ?
A. We keep out everything in that way that we can possibly get drawn away. There are small pieces, five or six inches long to a foot long they are cut off the ends of the edgings before they go into the laths, and small pieces off the ends of the boards. They are the only things that go through the hog.

Q. How fine is the material after it passes through the hogs ? A. It is cut up into little slices about a quarter of an inch. The material that we run through the hogging machines I do not think in any way interferes with the river. I do not think it would sink. When the Government some ten years ago made a very thorough examination of the river, Mr. Mather made it, he reported that if the sawdust and edgings and groundings were allowed to be put in he did not think it would interfere with navigation. He examined all our mills several times that summer and compelled us to run all these little pieces through the hog machines. The larger pieces and everything that people would draw away for wood by getting it delivered out of the mill for them for nothing was taken away. The little pieces that they refused to draw away were run through the hogging machines, and I have been doing that up to the present time.

By Honorable Mr. Smith :

Q. Do you keep a night gang to take that refuse away at night ? A. Yes.

Q. Do you ever find them throwing stuff into the river at night ? A. There is no place that they can get to the river with it at any time. The floors are all put down close and there is no place that they can get to the river.

Q. To save themselves labor, the men cannot throw the refuse into the river ?
A. No; we not only watch our own mills but we watch each others mills to see that there is nothing of the sort done.

Q. Supposing you decide on removing your mills from Ottawa, could you use any portion of your present machinery ? A. Yes; we could use some of the machinery and the shafting.

By the Chairman :

Q. Of course if you removed from here you would erect steam mills ? A. I think we can manufacture lumber with a steam mill a good deal cheaper now than with a water mill, the modern improvements in steam machinery are so great. You have a steady motion with steam all the time, but the water power is very irregular owing to the different stages of the water. Not only that, the other disadvantages of high water—the keeping of logs and holding of logs owing to very heavy rapids above the Chaudière and other heavy rapids below us, it is the most unfortunate place for the milling business of that kind that I ever saw.

The Committee adjourned until to-morrow at ten o'clock.

WEDNESDAY, 16th May, 1888.

Honorable Mr. OGILVIE, called and examined.

By the Chairman :

Q. You are a Senator of the Dominion ? A. Yes.

Q. You have a pretty fair knowledge of the Ottawa River ? A. Fair, so far as going up and down it pretty often is concerned.

Q. You have some knowledge of the milling interest carried on on this river ?
A. I did have. I have some knowledge of the business that is being done on the river.

Q. Have you any knowledge of other places where the lumbering business is carried on to any extent in Canada ? A. I have, of a good many places up west, especially along the Georgian Bay, where there are a number of mills scattered around the bay.

Q. We are engaged in an investigation as to the evils to the Ottawa River from the dumping of sawdust and other mill refuse into it. Would you tell us your experience with regard to those mills, how they deal with their sawdust and other

refuse from the mills? A. All the mills on the Georgian Bay—I have forgotten the names of some of them, but I know the localities of them very well—consume their mill refuse. There is one mill run by water down at the north end of the bay, and the rest of them that I have seen are steam mills. At Collingwood, Old Fort, Waubauskene, and along there, they burn all their refuse, not only sawdust but slabs and refuse of that kind in cupolas, because lumber is so plentiful there and the population is so sparse that they cannot sell the slabs for anything except what they make into laths.

Q. Does that remark apply to water mills as well as to steam mills? A. I have seen it at both. The sawdust, slabs and refuse that come out are dropped into what I, as a flour miller, would call a carrier—a chain with cross bars on it of wood, and the sawdust and refuse are tumbled into that, and that is continually working and carries the refuse out to the cupolas and burnt, and that is working continually while the mill is in operation. The material is thrown into that cupola and burnt steadily.

Q. By that means all the sawdust and refuse of the mills are destroyed. A. All burnt. Even those mills that work by steam consume but a small portion of the sawdust and slabs, and they have all to use cupolas to burn the mill refuse. The Waubauskene have two large cupolas.

Q. Do you know the size of those cupolas? A. They vary according to the size of the mill. I have seen them from a size that would cost \$2,500 to \$3,000, up to a size that would cost I suppose \$9,000 or \$10,000.

Q. Are they dangerous? A. I should not imagine that they are any more dangerous than a steamboat. I know two of my friends that have some mills up there, and the cupola stands about 100 feet at one place from the mill, and at the other thirty or forty feet from the mill, and I have known them for a great many years and they have never had a fire. Of course I know nothing about it, except that it is a new process, and having heard complaints about this river, whenever I saw a place where they did consume the sawdust, I naturally was interested in it and enquired about it. Three years ago this last summer I went around with a friend who has a tug there, to six of the sawmills in one day, and I took special pains to examine into these things to see how they consumed their refuse, simply because I had heard so many complaints about the Ottawa River, and I felt naturally anxious to see how the nuisance could be obviated.

Q. Really your investigation at that time was a comparative one with the Ottawa River? A. I have been about sawmills a good deal, but I do not know anything about the business except theoretically.

Q. I mean you chiefly made your investigation and drew your comparisons in reference to the Ottawa River? A. Precisely. The Ottawa here directed my attention to it, not then with any view to putting it to practical use, but from pure curiosity.

By Honorable Mr. Haythorne;

Q. Was this regarded as an expense or a convenience up there? A. They did not seem to think of it as an expense or a convenience or give any information about it. They merely had to do it and they took it as a matter of course. It was a part of their business, just as bringing logs to the mill or shipping lumber was. I never heard anything said, *pro* or *con*, because they said it was a thing they had to do. I spoke to Mr. James Playfair, of Playfair & Co., and to Mr. Dodge about it. My son was with the Playfair Company two years in the sawmill there, and that probably made me more interested in it. They did not pass an opinion on it as to the convenience or otherwise. It was simply something that they had to do and they did not give an opinion about it.

Q. Have they always been accustomed to consume their sawdust from the first start? A. That I could not tell you. They spoke of it as if it had always been done.

Q. A man establishing a new mill would naturally have a cupola to consume the sawdust? A. The Playfair mill was an old one. Playfair had bought it from Christie, and I do not know how long Christie had been running it. It is a comparatively old mill, so old that he told me recently that he expected in a short time to run out all his limits there.

By Mr. Christie :

Q. Were these mills situated in any town or city of any size? A. No, one of them, the Waubauskene mill has a little village about it of their own people.

Q. Something like Rockland down here I suppose, at Mr. Edwards' establishment? A. No. At Edwards' mills there is a village outside of that at Waubauskene. It is a village of their own hands, and it is the same at Playfair's. Playfair & Co. own the whole place.

Q. You say you saw one water mill which consumed its own refuse? A. Yes.

Q. Where is that? A. I have forgotten the name of it, but it is at the extreme end of the Georgian Bay.

Q. Is it a mill of large capacity? A. Yes, probably the next largest to Waubauskene mills. It is owned by an American company.

Q. Do you know the capacity of that mill. Would it be anything like the capacity of Bronson's or Booth's mills? A. I should think the water mill I speak of would be as large as Pattee & Perley's mill. That is the one I am most familiar with here. The Waubauskene mill is larger.

Q. You have only seen one water mill where they consumed their sawdust and refuse? A. Only one.

C. R. CUNNINGHAM called and examined.

By Mr. Christie :

Q. You are an Insurance agent living in Ottawa? A. Yes.

Q. And you represent how many Companies? A. Two—the North British and Mercantile and the Royal Canadian.

Q. You are interested in insurance on mill property, lumber, and generally all the buildings in Ottawa? A. On all kinds of property save steam mills.

Q. Will you be kind enough to tell this Committee what would be the effect of putting in a burner to consume the sawdust from the mills here. Would it be equal to establishing a steam saw mill here? A. In the Tariff "A" of the Underwriters Association, lumber contiguous to a water power or planing mill with a refuse burner in use shall rate as contiguous to a steam mill.

Q. Do you know any place at all in Canada or in the United States where there would be seven steam saw mills of the capacity of these in Ottawa? A. I know of no such place.

Q. Steam mills in Canada and the United States are all isolated in small villages I understand; you do not know of any in cities? A. I know of no steam mill within a city.

Q. How much more insurance would have to be paid in round numbers by the people of Ottawa in case these mills were required to have refuse burners—how much per annum? A. Double the insurance.

Q. How much per annum? A. The premiums on insurance just now are between \$120,000 to \$130,000 a year from Ottawa. It would increase the insurance in this city at least \$100,000 a year.

By the Chairman :

Q. Do you think the danger would extend to the whole city? A. Yes.

By Mr. Christie :

Q. Will you tell us what would be the risk on the Public Buildings of Ottawa? What is the value of the public buildings in Ottawa belonging to the Government? A. About \$7,000,000 altogether.

By the Chairman :

Q. What do you speak of? A. I speak of all the Public Buildings held by the Government in this city.

Q. Where did you get that information as to the value of the Public Buildings? A. From the Government's own reports.

By Mr. Christie :

Q. Will you tell me how much the risk of the destruction of the \$7,000,000 worth of property would be increased by putting in burners at the Chaudière?
A. Burners at Chaudière would be double the rate, provided the Government insured those properties, which they do not!

Q. What would be the risk? A. The rate would be double.

Q. As a risk, how much would the danger of fire be increased? A. I suppose the Government building now could be taken at about 75 cents for three years. In case burners were constructed here there would have to be a rate of one and a half.

Q. In case of burning the refuse the risk would be doubled? A. Yes.

Q. In case the mills at the Chaudière were changed practically into steam mills, would there be a danger that property in the City of Ottawa would become uninsurable? A. I cannot see how underwriters would insure it.

Q. To what class would Ottawa be reduced? A. I think we would come from tariff "A" down to "D" or "E."

Q. What do you call "D" or "E"? A. Every change of letter means ten per cent.

Q. And are "D" and "E" the lowest? A. No, there are lower classes—"F" and "G"

By Chairman :

Q. At ten per cent. of increase the change would be only 40 per cent.? A. It would double the risk on all this section

By Mr. Christie :

Q. Do you know of any place at all where the risk could be so great for a large city like Ottawa as it would be in case burners were put in here? A. I know of no place at all that could be compared with it.

Q. Would it be a matter of great importance to this place if a change were made? A. From the underwriting point of view it seems to me it would destroy it. It would cease to be insurable as it is now.

By Honorable Mr. Glasier :

Q. Are you aware that steam saw mills in New Brunswick in cities and towns where they burn their sawdust are insured and have been insured for thirty and forty years, and that no accident has happened? A. I never was there.

Q. I ask you are you aware of the fact? A. I am not aware.

Q. You do not know that there are six or seven steam mills in the city of St. John that are insured and that burn their sawdust? A. I do not know anything about it.

By Honorable Mr. Olemous :

Q. You are only giving your individual opinion I suppose, with respect to this insurance? A. I have the tariff.

Q. And this question has never been submitted to the Underwriters' Association? A. No; it has never been submitted to the Underwriters' Association.

Q. And of course they know nothing about the kind of erections that would be made, and they could not come to a conclusion as to that? A. The Underwriters would send a committee here to take the whole matter into consideration without doubt.

Q. Therefore it is premature to form an opinion as to what they would do until the facts were known? A. Of course I merely state what I believe is correct.

Q. What do they charge now for the insurable property at the Chaudière—the water mills? A. They charge two and a half per cent.

Q. Why should they charge two and a half per cent? A. That is the mill rate.

Q. Why do they make that difference in the mill rate? A. All mills are classed at that rate.

Q. Is it owing to the accumulation of lumber about the mills that the insurance rates are increased? A. The water mill up the Gatineau would be charged the same rate where there is no lumber piled.

Q. Where there is no lumber piled? A. Yes; there is no lumber piled at Gilmour's mills.

Q. Do you not remember the bush fire we had some years ago that burnt a large quantity of Gilmour's lumber? A. That fire occurred lower down the river.

Q. Do you not know that the rate is on the mills because of the immense quantities of lumber piled in the vicinity of the mills? A. It is not so. Gilmour's upper mill is the same rate and there is no lumber piled there.

By the Chairman:

Q. Do you say that the accumulation of lumber around the mills has nothing to do with it? A. I did not say that.

By Honorable Mr. Olemow:

Q. If there was no lumber piled alongside of those mills would the rate be two and a half per cent? A. I think it would for water mills. That is the tariff rate.

By Mr. Christie:

Q. Speaking about the burners for consuming refuse from water mills. Have not the Underwriters' Association taken into consideration the whole of this matter and fixed the tariff according to the evidence you have given? A. The Underwriters have a special rate for the city of Ottawa. They have fixed everything about the city of Ottawa for mills, lumber and everything in connection with it.

Q. But in regard to mills or burners have they not determined the actual figures by their tariff? A. Certainly.

By the Chairman:

Q. Did you not say just now that in case of the alteration of those mills, and provision being made for the burning of the sawdust, that then it would necessitate a committee of underwriters to decide what the increase of premium should be? A. Certainly.

By Mr. Christie:

Q. Is there not a particular rate for water mills without burners in your tariff? A. Yes.

HENRY EGAN, called and examined.

By Mr. Christie:

Q. You are an insurance agent of the city of Ottawa? A. Yes.

Q. What companies do you represent? A. The Royal of London and the Imperial.

Q. Will you tell me what is the difference between the insurance rates where mills are run with water power without a refuse burner, and one with a refuse burner? A. What distance would the refuse burner be from the mills?

Q. Say within 75 feet? A. The rate on a water power mill would be $2\frac{1}{2}$ per cent., and if a burner was within 50 feet, it would be 4.80.

By the Chairman:

Q. Suppose it were 150 feet away? A. If it were 200 feet it would not make any difference—I am speaking now of this question as the underwriters regard it.

By Mr. Christie:

Q. If there were seven water mills such as these at Ottawa with refuse burners in the neighborhood, what would be the increased insurance on property in Ottawa all around? A. It is very hard to answer that question, because we would want to see the construction of the burners before you could determine that.

Q. Well, a refuse burner? A. There are a dozen different kinds.

Q. Suppose the very best kind were put in, would the risk on property be increased in Ottawa? A. Certainly it would.

Q. Would it be all over the city? A. Yes, I think it would be all over the city.

Q. Would the rate of insurance in Ottawa increase, and to what extent? A. I could not tell.

Q. Would it be a large increase or a small increase with seven steam mills there? A. I think it would be pretty well increased, but I cannot say.

Q. Would the risk of fire to the public buildings be very largely increased?
A. Yes.

Q. I mean largely increased? A. Yes.

By Honorable Mr. Clemow:

Q. Your opinion is altogether predicated on the position of the mills? A. Yes.

Q. If the position was such as not to imperil the mills and the immense quantity of lumber piled in the yards and the city, it would not be increased? A. No.

Q. It is a matter of distance? A. Yes.

By the Chairman:

Q. Would the accumulation of such a large quantity of lumber be one of the factors to be taken into consideration in determining the risk? A. Certainly.

By Honorable Mr. Clemow:

Q. If all that lumber contiguous to the mills were removed and the insurance companies had to take a risk on the mills, what would it be? A. It would be two and a-half per cent.

Q. Would they make any difference if the lumber were removed? A. I do not know whether they would or not, but they have not.

Q. Do they not take that as an element of the risk? A. No.

By Mr. Christie:

Q. How far is the lumber from Gilmour's mills? A. It is not near the mills at all.

Q. Is it not three miles from the mill? A. Yes. They bring the lumber down in slides to the piling grounds.

Q. When you speak of erecting refuse burners for the mills if they were put up anywhere in Ottawa, would they not increase the risk of insurance all over the city? A. Yes, I think they would increase the rate a little; but if there is no lumber near it, if it were placed 200 or 300 feet away from any other building it would not be so dangerous.

Q. Now is there room to do that in the city of Ottawa, for the mills as they stand now? A. I do not think there is.

Q. Do you know, as a matter of fact, whether burners could be put in, in a city like Ottawa, without the consent of the municipality? A. I do not know.

JOHN MATHER, called and examined.

By Mr. Christie:

Q. You are engaged in the lumber trade now? A. I am, at Keewatin.

Q. Were you engaged for many years in the lumber trade in the neighborhood of Ottawa? A. Yes.

Q. Were you not appointed a commissioner to examine the channel of the Ottawa River on one occasion? A. On two occasions—in 1873 and 1877.

Q. Did you make a thorough examination of the channel of the river respecting the question of sawdust? A. The second time I did.

Q. Will you tell the Committee whether in your judgment the sawdust accumulates in the channel where the current is? A. Not where the current is.

Q. Does it interfere at all with the navigation in your judgment? A. Not with navigation, so far as I know.

Q. At what points of the river did you make this examination and how did you do it? A. I made the examination from Grenville up to the mills at Ottawa here and I used a machine for bringing up specimens of the bottom. I sounded I do not how many times—over 200 times in different places—and brought up the bottom every time and found what it was like.

Q. You were engaged at this for a length of time? A. I must have been a week at it.

Q. In your judgment the navigation of the River Ottawa is not interfered with by any sawdust thrown into it? A. I could not from that investigation find that there was any sawdust remaining where the current of the river was running.

Q. There is sawdust of course in the bays? A. Any amount of accumulation in the bays.

Q. Prior to 1877 I understand that the mill slabs were thrown in. Would the throwing in of sawdust alone have a less effect on the channel? A. The slabs remained in the current; the sawdust goes out of it if there is nothing to keep it there.

Q. Do you think there is any danger to the navigation of the Ottawa River by throwing sawdust into it? A. The only danger to navigation that I see, is at the mouth of the canal; it fills up there. The sawdust will come to the top of the eddy and prevent navigation there.

Q. That is the only place? A. There, and around the wharves of the millmen themselves.

Q. What kind of mills were you engaged in—water mills? A. Water and steam mills—principally water mills.

Q. Do you know of any water mill so constructed as to prevent the sawdust falling into the stream—or do you know of any way to prevent it? A. At Keewatin we do not let any sawdust in: that is a water mill: We keep it all out.

Q. How do you keep it out? A. We catch it as it falls and take it out by carriers and then cart it away.

Q. Was your mill lately constructed? A. It was commenced in 1879.

Q. It was constructed since any of those mills were built? A. There have been some new mills built here since then—one last winter and one the winter before.

Q. Are your mills driven with belts? A. They are driven with water wheels and belts on the water wheels.

Q. That is the same action as a steam mill? A. You can do it just as you like.

Q. It is the same action as the steam mill? A. Yes.

By Honorable Mr. Botsford:

Q. Does not the accumulation in the bays of the river gradually encroach on the channel? A. It increases to a certain point, but when it comes to that it is carried away. It may go down to another bay but it will not fill up further than to the current.

By the Chairman:

Q. But when all those bays get filled what will be the effect on the river? A. It will have to go further on. It is impossible where the current is of a certain speed for the sawdust to remain. Where there is sand the sand remains but the sawdust goes on. When the sawdust comes to an eddy it remains there.

By Honorable Mr. Haythorne:

Q. Is there any danger of forming a bar across the current? A. Not where there is a current—a current of two miles an hour will carry it away.

By the Chairman:

Q. Is there a current of two miles an hour all the way from here to Grenville? A. Often at places where I found the water 90 feet deep there was no sawdust in the river at all. I think it was in June when I sounded it, and there was no sawdust on the bottom where the river was 90 feet deep.

By Honorable Mr. Glasier:

Q. Do not slabs and edgings sink after a time? A. Yes, and they are the worst refuse you can let into the river.

By the Chairman:

Q. Will they stay in the channel? A. Yes, they go down end foremost and stick in the bottom and others float down against them and the sawdust accumulates around them.

Q. And thereby will block the channel? A. Yes, there is no doubt about that.

By Honorable Mr. Clemow:

Q. You undertook this examination in 1873 and 1877? A. Yes.

Q. Who was with you? A. I was alone in 1877.

Q. In a steamboat? A. In a small steamboat.

Q. You did all this work in a week? A. I think in a week.

Q. What kind of boring tools had you? A. I could hardly describe the sound-

ing machine that I had. I may tell you that I copied it from drawings I saw of the tools on board the "Challenger," that ship that went out and made soundings for the Government.

Q. You made a perfect examination in one week? A. As far as I did it was perfect. I can show you bottles, that I have to this day, of what I took up, and there is no sawdust in it.

Q. You admit that the bays were all being filled up with sawdust at that time? A. Yes, commencing at Ottawa, going downwards.

Q. Did you examine the Mackay's Bay out here? A. Yes.

Q. How did you find it? A. It was full of sawdust out to the current.

Q. Were you here before the mills were erected at the Chaudière? A. I was here in 1856.

Q. At that time what was the state of the river? A. It was very different then. Those bays were not filled with sawdust.

Q. As this sawdust becomes saturated with water it sinks to the bottom, does it not? A. Yes.

Q. And the accumulation of this sawdust, with the refuse from the hogging machines, I suppose, forms an impediment that is very difficult to remove? A. I do not think it is very difficult to remove with a dredge. If it were mixed with slabs it would be different.

Q. Can it be removed with an ordinary dredge? A. I think the ordinary spoon dredge would.

By the Chairman :

Q. You mean where there are no edgings? A. Yes.

By Honorable Mr. Clemow :

Q. I am referring to dredging where there are edgings? A. There should be no edgings now. The mill men are not allowed to put edgings into the river.

Q. What effect has that refuse from the hogging machines on the navigation? A. It would make the accumulation easy to be dredged; that is, it could be dredged. If there were slabs it could not be dredged. With the chips from the slabcutter it can be mixed up as easily as sawdust.

Q. It is an advantage to have this stuff from the hogging machine? A. Yes, for the protection of the navigation of the river.

Q. Have you seen furnaces erected at any point? A. Yes, I have seen them.

Q. How do they work? A. I have seen them working in different ways. There are different constructions of these furnaces.

Q. And you think they can be constructed in a way that would easily be worked, and at the same time not incur any additional risk? A. They certainly incur a risk of fire near where they are.

Q. According to their construction? A. Yes, there are some different from others of course.

Q. But a machine could be made that could be perfectly safe I suppose? A. You cannot prevent sparks escaping at the top of the chimney.

Q. You can take ordinary precautions against it. For instance you can have a chimney long enough—it is a matter of expense entirely. A. Not entirely. Where you have sparks from the burning they ascend the chimney.

Q. Is it a matter of impossibility to construct a machine that will burn the refuse without incurring any out of the way risk? A. What do you mean by out of the way risk?

Q. In the way of fire risk talked of by these gentlemen. A. There will certainly be more risk than if there was no burner there. I think myself the insurance people have too many fads about the matter. They raise objections really where there is no practical objection for their own sake. I know that very well.

By Mr. Christie :

Q. Do you know of any place in the Continent where seven mills of the sawing capacity of those at the Chaudière, are situated in a large settlement like Ottawa?

A. Yes, go to the town of Muskegon, and you will find six or seven mills there all with burners.

By the Chairman :

Q. In the town ? A. Yes.

By Mr. Christie :

Q. That is altogether a lumbering town ? A. Yes.

Q. What is the population of Muskegon ? A. Between forty and fifty thousand any way.

Q. A larger city than Ottawa ? A. Yes.

Q. Do you know if the mills are situated as near to the city as the mills are here ? A. The mills are among the houses and the houses among the mills in many cases. It is very much crowded.

Q. Do you think it increases the risk of fire or the rates of insurance ? A. It must increase the cost of insurance.

By Honorable Mr. Clemow :

Q. Do you know anything of the fire apparatus connected with the match factory at Eddy's ? A. No, not personally.

Honorable Mr. GLASIER called and examined.

By the Chairman :

Q. Do you wish to make a statement about the saw mills in New Brunswick ?

A. Yes. I will commence with the harbor of St. John and the parish of Portland which are joined together. There are seven or eight mills there. There are no water mills there and those mills burn all their sawdust and a large portion of their slabs, and they have been there for 30 or 40 years and I have never heard of any accident. I do not think the fire risk is increased though they are in the middle of the place. There is one mill there that is run both by steam and by water and they burn their sawdust. That mill has been there for forty years, and they have got a large town around them and a station house. The railway runs through the place. I have never heard of an accident there. Right in the city of Fredericton there is a mill that has been running for twenty years and they burn their sawdust.

By Honorable Mr. Botsford :

Q. What is that mill ? A. That is called the Easty mill. And then a mile below the town, Morrison has a very large mill that saws about 50,000,000 a year. It sawed more than that this winter. His mill was burnt down but the fire took from the furnace inside—his own furnace. He did not burn his sawdust at that time. There is another mill below that half a mile. It is a continuous settlement along there. They cart their sawdust and refuse out and burn it, the only mill on the river that does not consume its sawdust and refuse is Gibson's. The sawdust from the mill goes into the river by some concession that the Government here have made. They have arranged to let it go into the river but he burns his slabs and refuse right along side of his mill. There are other small mills up the river but they are of no account. As to the navigation of the river St. John there are several shoals in the river where the dredge is at work every summer almost. They dug a channel through half a mile long and ten feet deep.

Q. Where is that ? A. At Oromocto shoals. The hands that work on the boat told me that two or three feet down they found as much sawdust as mud and earth all mixed together. It comes in the spring of the year and lodges on the shoals. There is a good deal of sediment there also and it lodges. That current is as strong as the current of the Ottawa. It runs four or five miles anyway and last spring it ran at a higher speed than that. These shoals are increasing continually from all those things accumulating there. It is ruining the fish in the river. That is my experience of the past forty years. As to the increased rates of insurance they do not seem to make any increase at St. John.

Q. Has the salmon fishing decreased in the streams that run into the St. John? A. Yes. The streams where the saw mills are located are completely ruined for fishing. On the Nashwaak, where Gibson's mill is situated, which used to be a good river for salmon, they are completely gone.

Q. The salmon used to spawn there, I believe? A. Yes; I have caught seventy in a day right on my own shore, a little below Fredericton. We used to have the shad, the gaspereaux and the salmon and sturgeon in large quantities. Now they are diminished very greatly. Most of the salmon now that we get are from the north shore—the Baie des Chaleur and the Miramichi.

Q. But still they catch a good many in the harbor of St. John? A. Yes, a considerable number and around in the bays, but so far as the obstruction of the River St. John is concerned, it is a very serious thing, and if Gibson continues depositing the sawdust and refuse in the river a few years longer without check, it will be worse.

Q. How long have you been engaged in the lumber and milling business on the River St. John? A. I am not in the milling business at all. I have been in the lumber business 60 years.

Q. On the River St. John? A. On the River St. John and its tributaries. I have taken timber from opposite Quebec at the head of St. John 400 or 450 miles.

Q. You ought to be well acquainted with the navigation of the River St. John? A. I tell you the navigation of the river is very much impeded. Bars are forming all the time from this material and the other stuff coming down the river.

CHARLES PROPER called and examined.

By Honorable Mr. Olemow:

Q. Where do you reside? A. In Gloucester when at home.

Q. You are employed, I believe, by McLaughlin Bros., in Arnprior? A. Yes, I am building a steam mill for them.

Q. They have a steam mill and a water mill? A. They have.

Q. How do they dispose of their sawdust from the steam mill? A. They utilize their sawdust there for fuel.

By the Chairman:

Q. Does it make good fuel? A. Yes.

Q. Do the boilers use all the fuel? A. No, not all, the surplus is drawn away in dump cars.

By Honorable Mr. Botsford:

Q. Where is it deposited when carried away? A. They deposit it on a low spot of ground—a marsh.

By Honorable Mr. Haythorne:

Q. Is that found to be an inconvenient and expensive process? A. It is pretty expensive, still they do it; they are obliged to do it. They are making land with it—making a piling ground.

By Honorable Mr. Olemow:

Q. Have they not also a burner for the sawdust they do not use for the boilers? A. They burn the refuse from the lath mill and the buttings from the butting saw.

Q. Has there been any increase in the insurance on their property owing to the consumption of sawdust by burning? A. I do not know anything of that part of it; I think not though.

Q. But they allow none of the refuse to go into the river? A. Not from the steam mill.

Q. How long has that steam mill been erected? A. I think it is seven years this summer.

Q. And there has been no accident by fire or anything of that sort? A. No.

By Mr. Christie:

Q. What do they do with the refuse from the water mills? A. The sawdust goes into the river.

Q. They had a steam mill burned there, had they not? A. Yes, that was some years ago.

Q. When you speak of the sawdust being utilized as fuel, you mean sawdust for driving the engines? A. Yes, they use it for heating the boilers.

Q. But it would not do for fuel for ordinary domestic purposes? A. No, not very well without it is put in some different shape.

Q. How far from the mill is the burner? A. The burner itself is I think about 100 feet or thereabout. Then there is a tube from that which takes the smoke about 200 or 300 feet.

By the Chairman :

Q. Has the mill plenty of ground about it? A. Yes, they have plenty of space. It is down on the shore of the Chats Lake.

By Honorable Mr. Clemow :

Q. You built the mills owned by Grier & Co.? A. Yes.

Q. Can you give us an idea of the arrangement you made there for disposing of the sawdust? A. I made arrangements there so that the sawdust can be taken off if it is required.

Q. Is that a water mill? A. Yes.

Q. You made arrangements to convey the sawdust out of the mill instead of allowing it to drop into the river? A. It is built in such a shape that the sawdust can be carried out by putting in carriers.

Q. What is the capacity of that mill? A. It ought to cut from seventy-eight thousand to one hundred thousand feet a day.

Q. And by the way it is constructed, they can take away all the refuse and sawdust, and prevent it from going into the river? A. Yes.

Q. There is no doubt about that? A. No. The carriers take out all the refuse now—that is the edgings, slabs and shims and things of that kind; but the sawdust goes into the river.

Q. So that as far as that mill is concerned, there is no necessity for the sawdust going into the river? A. No, not by putting in proper machinery.

By Mr. Christie :

Q. That mill was built quite recently? A. Last season.

Q. And built with that object? A. Yes, I got orders to build it with that object.

Q. It is not driven the same as other mills? A. It is driven on the same principle as a steam saw mill with a belt.

By Honorable Mr. Clemow :

Q. Do you know how Hurdman's mill is built? A. I do not.

Q. Do you know anything about Eddy's new mill? A. I think they can take the sawdust out of Eddy's too, it is a belt mill.

By Mr. Christie :

Q. It was built for that purpose? A. I do not know; it is a belt mill.

By Honorable Mr. Clemow :

Q. There is no difficulty however in constructing a mill so that they can dispose of the sawdust without throwing it into the river? A. No.

By the Chairman :

Q. Would you state to the Committee whether it would be possible to convert the existing mills at the Chaudière Falls into belt mills and supply appliances for the removal of sawdust, just as the mills you have referred to? A. It can be done of course.

Q. Would it involve much expense? A. It would be a big expense.

Q. Have you any idea how much? You are a practical mill builder? A. I work at it most of the time.

Q. Have you any idea then what the expense would be in the case of any one of those mills? A. It would be about the same expense as building a new mill. Of course they would have the building in their favor, and the frame if it is good, but most of the rest of the machinery would be of no use.

Q. It would have to be new machinery? A. They would require different wheels and a different rig altogether.

By Honorable Mr. Botsford:

Q. Do you say that can be done without rebuilding a mill? A. The frame might do, but they have got to tear out everything they have in the bottom—water wheels and everything and remodel it and build up piers.

Q. What do you think would be the expense of changing a mill like Mr. Bronson's? A. That is pretty hard to get at.

By Mr. Christie:

Q. Would it not come up to \$75,000 or \$100,000 to change it into a belt mill? A. I presume it would.

Q. And in Booth's mill it would cost the same thing? A. I think so.

Q. And Perley & Pattee's mill? A. About the same thing—\$75,000.

By the Chairman:

Q. You merely speak now from a rough estimate? A. Yes.

By Honorable Mr. Clemon:

Q. With reference to the Bronson mill, was it not constructed recently with a view to provide for the keeping of sawdust and refuse out of the river? A. I could not say.

CAPTAIN BOWIE called and examined.

By Honorable Mr. Clemon:

Q. You have been a resident of Ottawa a long time? A. Yes, about twenty seven years.

Q. And you have been navigating the Ottawa continuously every season during that time? A. Yes.

Q. You know a good deal about the subject of our enquiry. Can you give us the benefit of your experience, chiefly with reference to the navigation of the Ottawa? A. When I first came up the river here I was captain of the steamer "Phoenix." Then I never had any trouble whatever on the shoals. The water was deep enough both in, high and low water at all seasons. After a few years, when the mill refuse was going in, and slabs and edgings, they filled up most of the fronts of our wharves, and at the locks here there was a large quantity of edgings, which are still there. In the channel we find a great deal of sawdust. Of course, at this pitch of the water, or at the time Mr. Mather took his soundings, which was in high water and there was a strong current, it is not so apparent, but in September or October I can stop the boat and bring up a volume of sawdust that would astonish you.

By Honorable Mr. Botsford:

Q. Was that in the channel? A. In the channel of the river. Of course, at this season of the year, the strong current carries it away. At the locks here I was sending a boat up to the exhibition grounds a year ago, and the captain came to tell me he could not get into the locks, though the boat was drawing only four feet of water. I told him to go back and work her in, he did so, and spent several hours working at the sawdust and finally got in. That was in September, during the exhibition. She was coming up to convey passengers from the basin to the exhibition grounds. She was a large steamer and filled the locks.

Q. What part of the channel of the river is it that you can stir up the sawdust with a steamer? A. That is at Way's shoals.

Q. How far is that from the Chaudière falls? A. It is twelve or fourteen miles.

By Honorable Mr. Macdonald (B.C.):

Q. What depth of water is there over it? A. Seven or eight feet. The Queen's wharf, where we now lie, had at one time over 100 feet of water. I have seen the "Peerless" take ten minutes to get to the wharf to tie up.

By the Chairman:

Q. And she draws how many feet of water? A. She draws six feet. I have seen her ten minutes working backwards and forwards trying to get into the wharf,

and I have seen the cabmen get hold of the springing line and walk on the sawdust between the vessel and the wharf. We used to lie in there in the winter with the steamers, but we found the sawdust had so filled up the bay, that we have had to leave the wharf and take the risk of the ice out in the stream.

Q. Did you not, at one time, lay up your steamers in Mackay's Bay? A. Above Mackay's Bay, in New Edinburgh Bay.

Q. Is there much risk of ice where you have to lie up? A. Yes.

Q. The bays of the river are completely destroyed as winter quarters for steamers? A. Yes.

By Honorable Mr. Clemon :

Q. Have you seen any of those explosions in the river that are spoken of by other witnesses? A. Yes, from L'Original to Ottawa.

Q. Have you found any inconvenience from them? A. The odour arising from them is not very pleasant round the steamer lying at a wharf. There is a strong, gassy smell from them.

Q. Is it unwholesome? A. I presume so.

Q. Some observations have been made here about vessels carrying smaller cargoes in years gone by than they do at present. I suppose you can give the Committee an idea why it is so? A. The vessels that carry double the quantity of lumber now that they did in former years have different bearings and different beams, but they do not draw any more water. At that time, when you were steamboating, and when I first came up the Ottawa you could not get a barge measuring over 90 feet through the Grenville Canal.

Q. Do you recollect in the early days about the fishing on this river? A. I do not recollect much about it.

By the Chairman :

Q. What in your opinion will be the condition of the river at some future period, say ten or twenty years hence, if this practice of throwing in mill refuse is continued? A. We would have no river at all.

Q. When the bays become filled, is it probable that the channel will also fill up? A. That is my impression, it must fill. For instance, I have paid particular attention to Templeton wharf last fall. Below the wharf I can show any gentleman on the Committee at any time during low water, where you will find a layer of sand 5 or 6 inches, then a layer of sawdust 5 or 6 inches, then sand again, and so on continuously to the level of the original bottom of the river.

By Mr. Christie :

Q. You say you can find sawdust in the channel there at low water? A. Yes.

Q. Is that sawdust not carried away when the water is high? A. I presume some of it must be carried away, but it cannot possibly be all carried away if it is covered up with the silt that comes down from the small rivers.

Q. If soundings were made now in the channel in the high water, would you be able to find sawdust in the bottom? A. I am not prepared to state that, but I presume you would.

Q. As a matter of fact you do not know? A. No, I have not tried it. In low water is the time to judge, and find whether sawdust is deposited in the channel. When the current is running six or seven miles an hour the sawdust is floating. I can take you down now and turn up sawdust in the channel, but whether it is the sawdust of former years or sawdust of the present year, I am not prepared to say.

Q. Would not a test at high water when the current is swift be the best way to determine whether the sawdust remains in the channel? A. I think not, and I will tell you why: In the low water there is always a certain amount of silt coming down the smaller streams, particularly down the Gatineau and Blanche. At the head of this shoal at the Blanche River there are two little outlets, therefore if in low water this sand and gravel or silt coming down these streams it must settle on that sawdust, because there is no current. It is almost dead water in September and October on that shoal.

Q. The question is can you say whether the spring freshet does not carry away

the sawdust which you find in the channel during the low water in the fall? A. I cannot answer that.

Q. So that you cannot say whether the sawdust does permanently fill up the channel of the river? A. There is no question about it, it is permanently filling up the channel of the river—encroaching upon the channel.

Q. Did you ever notice in the sawdust bank at McKay's Bay where the current strikes a body of sawdust there that it is cut down clean? A. Yes, but do you not see this has been piled up for years and as the water falls the sawdust must tumble over from the top.

Q. At McKay's Bay, there is a deposit of sawdust where it strikes the channel, is it just not as clean cut down as a ledge of rock? A. It does not strike the channel there, it is very deep water there.

Q. But there is a large deposit of sawdust there? A. Yes, but I have not been in to see it at all. It does not come near the channel at all. We pass a long way from it.

Q. You come pretty close to the shore in passing up by Rockcliffe? A. You see there are lots of logs in there, and the working of the current and the waves of the steamer move these logs, and, of course, would cause the sawdust to fall.

Q. Just immediately before you get to McKay's Bay, as you come round the point, you keep close to the shore? A. No, we keep straight up some distance from the shore. We are quite close to it at Rockcliffe.

Q. Do you not keep by the shore a little when you come round the point at McKay's Bay? A. No, we come straight up; we do not come within hundreds of yards of the sawdust shoal in McKay's Bay.

Q. You never made an examination of those bars in the channel yourself? A. No. I have stuck a pike pole into them.

Q. You know that these barges that navigate there draw 6 feet of water? A. Yes, and I know they were all aground last fall below Rockcliffe, at the point you speak of. The channel is altogether changed there. Formerly we had a good channel there, but now the channel is close to Hillman's mills. The closer we keep to the shore at Hillman's mill the better. We have found out a new channel in the low water last summer.

Q. The water comes down more violently now in the spring since the country has been denuded of the forest? A. Yes, I think we get rid of the snow more quickly.

Q. So that all the rivers running into the Ottawa, and the Ottawa itself, is subject now to heavier freshets and they come more suddenly? A. Yes.

Q. And these freshets bring down a larger quantity of debris than formerly? A. Certainly.

By Honorable Mr. Clemon:

Q. The current is much stronger on top than below? A. Yes, it is much greater on top than in the bottom of the river.

Q. Therefore, the debris would be taken off by the heavier current? A. Yes, and might never strike the bottom at all.

By Mr. Christie:

Q. Do you know whether the place where the barges stuck last summer was a sand bar or a sawdust bank? A. It was sand and sawdust mixed—lots of sawdust. We found this new channel last fall, near Hillman's mills, by accident, from the fact that all the barges were aground in the channel—the barges of Mr. Bangs as well as those of Mr. Murphy.

By Honorable Mr. Clemon:

Q. Have you discovered any difficulty in managing your boilers from the sawdust? A. Yes, in going through the sawdust we find that we have to keep two injectors in the boiler, and the engineer has to work them by opening one and shutting the other. The sawdust gets in and opens up the valves of the injection pipes and holds them there, and the water runs out of the boiler. The engineer attributes

it to the sawdust. She gets hot occasionally, while lying at the wharf here particularly.

SYDNEY SMITH called and examined.

By Honorable Mr. Clemow :

Q. You are a resident of Ottawa. A. Yes.

Q. And you are connected with the Rowing Club here? A. Yes.

Q. Do you know anything of this sawdust question? A. No, only in relation to boating. I have been connected with the Rowing Club for 20 years.

By the Chairman :

Q. Will you state what was the condition of the river when you knew it 20 years ago as compared with what it is now? A. It is very nearly the same now as it was then, as far as the sawdust is concerned. We suffered from refuse on top of the water then as we do now, but I do not know that it is an insurmountable obstacle to boating. Of course we boat in open water and do not have occasion to go into the bays to any great extent. The river certainly would be very much better for us if the sawdust were not thrown into it and did not accumulate in the bays. We sometimes suffer inconvenience at the boat house, which is situated in the bay at the mouth of the lock. We find there sometimes, when the wind prevails for the north-west, that it is very difficult to get out. The sawdust floats in in large quantities and makes it difficult to take a boat through it.

By Honorable Mr. Clemow :

Q. Do your boats ever sustain any injury by coming in contact with floating mill refuse? A. We suffered damage more from stray sawlogs and stumps and things of that kind.

Q. Do you suffer any from mill refuse? A. Yes, to some extent from mill refuse.

Q. I have been told that some of your boats have been damaged and broken by slabs? A. They have not been broken from that cause. We have come in contact with sawlogs and stumps, and oars have been broken, and some of the valuable racing boats have been damaged in that way.

By Mr. Christie :

Q. When the sawdust blows into the bay here, a change of wind will take it out again into the channel? A. Certainly; we do not suffer great inconvenience at all times.

Mr. CHRISTIE states to the Committee that he has two more important witnesses whose evidence is necessary to complete the case for the lumbermen, and asks that the Committee postpone their report until they are heard. If further evidence were taken the lumbermen would be in a position to show that the navigation of the river was not at all injured by the sawdust going into the river. He asked that the Committee should take a note of his request that the mill owners desire to give further evidence before the Committee report to the House.



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